Electrical World

JANUARY 24, 1942

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38th ANNUAL STATISTICAL NUMBER

ANNOUNCEMENT!

the NEW Murray TYPE "A" METER CONNECTION BOX

—now ready

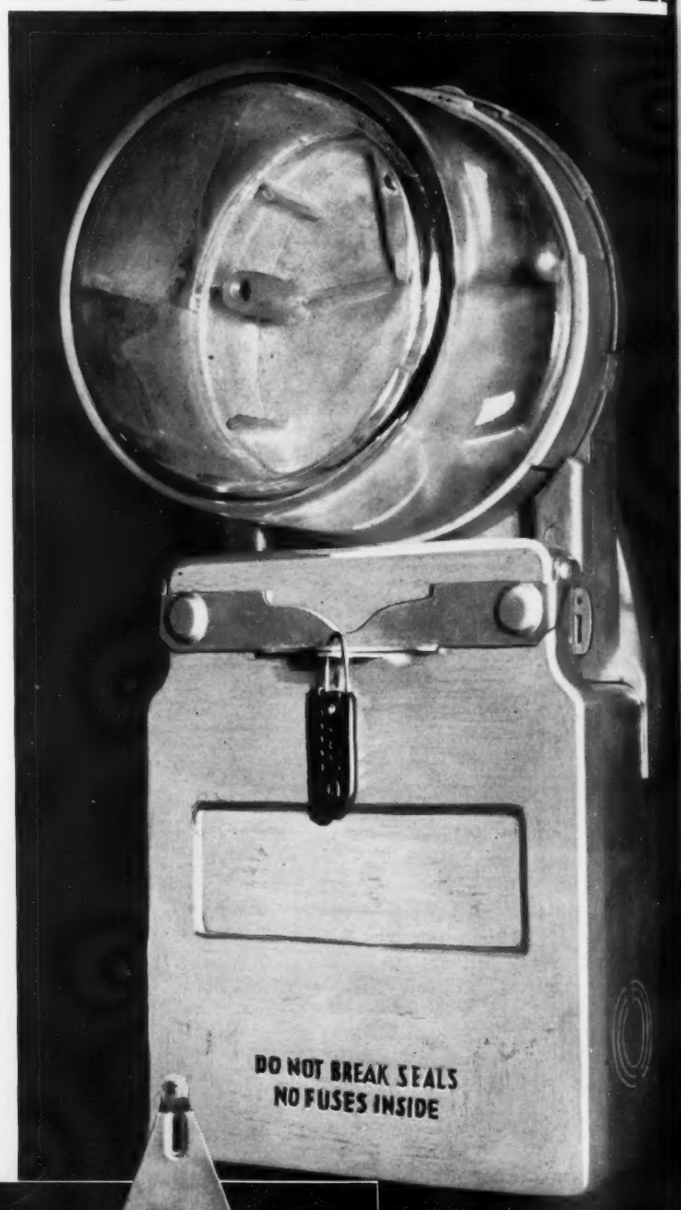
for

DELIVERY

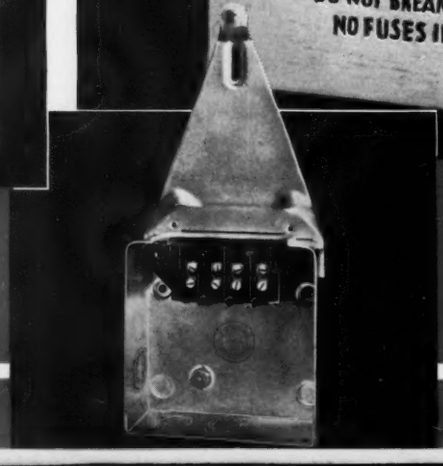
BECAUSE of the aluminum shortage, this new Murray Type "A" Box (for modern bottom-connected meters) is made of rust-inhibited steel.

It has outstanding advantages—(a) cover construction conceals attachment screws and "lox the box" with just a single seal; (b) it accommodates the same meters in the same way; (c) inside, it provides 20 per cent more wiring space; (d) it occupies the same wall space; (e) it fits wherever the old box did; (f) its mounting holes are in the same locations. No finer Type "A" box has ever been made.

Utilities are invited to send for one—Cat. No. 9600 Meter Box—on approval. Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, N. Y.



Cat. No. 9600 Consists of Box and Cover, Meter Test and Connection Block, Connection Links, Meter Mounting Screws.



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Electrical World

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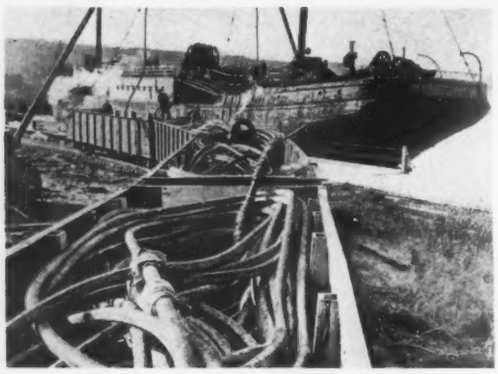
Most of the Cables for High Voltage Jobs Like These

ARE MADE BY

OKONITE

Diver checks trench-laying of high voltage submarine cable on ocean floor. Cable section (⅓ actual size) shows construction of 22,000 volt, 500,000 CM non-leaded Okolite-insulated submarine cable.

Applying the galvanized steel armor wire and saturated jute to a 5½" diameter Okonite submarine power cable.



22,000 feet of Okonite submarine power cable in one continuous length. This cable is the third in the submarine series ordered by the same customer within the past 15 years.

Special reels equipped with lifting beams simplify transport of huge cable reels from factory to site of installation.

Okonite has earned the privilege of manufacturing the majority of the high voltage rubber-insulated submarine cables laid in the rivers and territorial waters of the United States during the past 5 years.

The following records have been established:

VOLTAGE: ***up to 35,000 volts non-leaded***
DIAMETER: ***up to 5.6 inches***
LENGTH: ***up to 22,000 feet without a joint***

A partial list of Okonite rubber-insulated submarine cables operating at 13,000 volts and over, includes installations in every major area of the country: California, Pennsylvania, Washington, Rhode Island, Texas, New York, Illinois, Louisiana and Virginia.

When you are figuring on a submarine cable installation, ask Okonite engineers to make recommendations. These will include proper cable design and test procedure, preferred methods for shipping the cable and suggestions as to installation practise.

THE OKONITE COMPANY
Passaic, New Jersey
Offices in principal cities

OKONITE OKONITE **SUBMARINE CABLES**

ABSORPTION

AMERICAN INDUSTRY using everything that it had last year was still unable to superimpose defense demands on top of normal business without the latter suffering. The electric utility industry, on the other hand, except for isolated areas, was able to absorb the tremendous defense loads of the past year without any undue strain. This is clearly demonstrated in the 1941 statistics of operations as they appear in this issue.

The increase in production in 1941 was 23 billion kilowatt-hours. The total annual production at the beginning of the last war was 24 billion kilowatt-hours, which seemed pretty large then, when we were building a brand new army of four million men, besides making munitions and guns for the allied forces.

Part of our ability to absorb last year as increase what twenty-five years ago was the total output is due to a generating capacity nearly five times as great, part is due to increased diversity, part to widespread interconnection, part to smaller reserve requirements—all of which added together means better use of equipment.

This is borne out by the figures. When the previous war broke out the total generating capacity of the country was being worked about 30 percent of the time, while last year it was being worked nearly 50 percent of the time.

Nor have we yet exhausted the productivity of a kilowatt. There as still many more kilowatt-hours to be had from existing capacity for customers who will use them when and where available.

This tremendous load absorptive capacity of the electric utilities is of major importance to the nation in wartime, because modern war is a battle of production—and that takes kilowatt-hours. Unlike copper or aluminum or steel or any of the critical items, there should be no shortage of kilowatt-hours to limit increased war production, such is the absorptive capacity of this industry.

38th

ANNUAL STATISTICAL NUMBER

Summary Statement of

OUTSTANDING FACTS

	1932	1934	1936	1937	1938	1939	1940	1941*
FIXED CAPITAL ($1,000)	12,664,377	.....	.....	12,940,993	†13,003,000	†13,011,000	†13,057,000	†13,106,000
Securities issued [1]	470,257	131,175	1,331,940	646,312	964,005	996,347	989,459	740,832
New capital	165,728	2,431	59,727	81,984	123,056	16,219	92,376	97,065
Refunding	239,112	128,744	1,272,213	563,699	840,949	980,128	897,083	643,767
REVENUE [2] ($1,000)								
From ult. consumers	1,813,717	1,831,871	2,044,587	2,160,798	2,156,580	2,289,583	2,440,218	2,670,450
Rural	47,128	49,183	59,286	37,726	38,928	45,484	49,473	63,510
Residential	640,385	648,802	696,997	759,824	802,532	843,158	895,951	939,058
Small light and power	500,993	490,420	562,122	616,438	632,091	660,683	689,253	727,363
Large power and light	474,425	499,452	581,149	583,197	518,694	572,659	631,428	761,300
Other consumers	150,786	144,013	145,032	163,611	164,334	167,597	173,752	179,219
EXPENDITURES ($1,000)								
Capital	285,000	147,654	289,710	455,480	482,000	430,000	596,580	654,148
Operating, total	817,950	.....	.....	1,027,588	.....	.....	.....	.....
Salaries and wages	323,880	316,000	360,000	470,353	460,000	469,500	488,000	537,000
PRIVATE COMPANIES ($1,000)								
Operating revenue	1,713,000	1,710,000	1,911,000	2,031,000	2,018,000	2,148,000	2,277,000	2,491,000
Operating expenses	618,000	635,000	721,000	781,000	762,000	798,000	851,000	955,000
Taxes	201,000	239,000	281,000	308,000	323,000	352,000	413,000	510,000
OUTPUT [3] ((1,000,000 kw.-hr.)								
Generated	82,377	90,806	112,181	121,837	116,681	130,336	144,985	168,000
From steam	48,457	56,451	71,756	76,330	70,727	85,007	95,675	115,600
From water power	33,322	33,713	39,516	44,489	44,834	44,021	47,753	52,400
From internal combustion	598	642	909	1,018	1,120	1,307	1,557	.....
CAPACITY [3] (1,000 kw.)								
Generator ratings	35,991	35,791	36,564	37,134	39,042	40,318	41,639	44,352
Steam	25,474	25,524	25,519	25,873	27,203	28,047	29,019	31,996
Hydro	9,583	9,742	10,436	10,576	11,066	11,415	11,675	12,356
Internal combustion	487	525	609	685	773	856	945	1,000
FUEL CONSUMPTION [3]								
Coal and coke (1,000 short tons)	30,296	33,561	42,025	44,766	40,212	46,223	53,398	60,660
Oil (1,000 bbl.)	7,967	10,391	14,119	14,143	13,077	17,423	16,772	19,760
Gas (billion cu. ft.)	108	128	156	171	171	191	183	200
ENERGY SALES [3] (1,000,000 kw.-hr.)								
Ult. consumers	63,711	71,082	90,044	99,359	93,731	105,768	118,643	140,340
Rural	1,579	1,857	2,138	1,670	1,577	1,881	1,991	2,350
Residential	11,494	12,233	14,992	17,691	19,371	21,084	23,318	25,318
Small light and power	12,106	12,278	15,612	18,075	19,137	20,722	22,373	24,730
Large power and light	30,964	36,944	48,655	51,360	43,140	51,108	59,557	76,247
Other	7,568	7,770	8,647	10,562	10,505	10,972	11,405	11,875
CUSTOMERS [3] (1,000)								
Total number	23,878	24,663	26,206	27,262	28,064	29,105	30,191	31,553
Rural	709	744	1,043	519	526	634	686	988
Residential	19,140	19,866	20,988	22,372	23,112	23,965	24,952	25,972
Small light and power	3,604	3,670	3,825	4,072	4,127	4,215	4,260	4,300
Large power and light	371	324	280	197	192	184	178	176
Other	54	59	70	102	107	106	115	117
People in electric lighted homes	81,380,900	84,501,000	90,327,100	93,853,100	96,915,800	100,855,900	97,424,400	102,448,000
Per cent of total population	65.4	67.1	70.7	73.1	74.9	77.3	74.0	77.1
EMPLOYEES, total	244,573	247,000	268,000	279,000	270,000	269,000	265,000	270,000

* Estimated, generally on ten months' operations. [1] Includes warrants and rights. [2] Revised figures beginning with 1937 conform to Uniform System of Accounts. [3] Includes other electric, in addition to light and power. † Electrical World Estimate.

Ready for War's Demands

HIGHLIGHTS

OUTPUT: 168 Billion Kw.-Hr.

Rose 16 percent over 1940. More than two-thirds of total from fuel power. Private utility facilities accounted for 88 percent of total production.

CAPACITY: 44 Million Kw.

Up 6.5 percent in year. Fuel capacity accounts for 72 percent of total. Private utility capacity is 84 percent of total. Reserve smaller in 1941.

NEW CAPACITY: 3 Million Kw.

Scheduled capacity for 1942 and later adds up to nearly 9,000,000 kw. 68 percent of prospective additions by private companies; 70 percent fuel.

ENERGY SALES: 140 Billion Kw.-Hr.

More than half of total to industrial customers, who took 28 percent more than in 1940. Rate of increase in residential shows signs of slackening.

REVENUE: $2.7 Billion

Total up 9 percent in year; gain about half of percentage increase in sales. Residential rate continues lower to new record at 3.73 cents. Large light and power revenue returns to second place for first time since 1937.

CUSTOMERS: 32 Million

Increase in year of 4.5 percent largest since 1927. Nearly a million of increase in residential classification, up 4 percent over previous year.

OPERATING EXPENSES: $1 Billion

Operating expenditures up 12 percent in year with less than 10 percent gain in revenue. Taxes take 21 cents of revenue dollar.

FINANCING: $740 Million

Total about 250 million under 1940, and lowest since 1937. Slight increase in new capital. Public offerings at new low; institutional gain.

BUDGET: $700 Million

Up 7 percent over 1941 expenditures, with increases indicated for all major construction, save distribution. Generating capacity gets 45 percent.

MANUFACTURING: $4 Billion

Gained 70 percent over 1940 to top previous record year, 1929. Peak increases in all lines. Shipments catching up with orders at end of year.

REA: 900,000 Customers

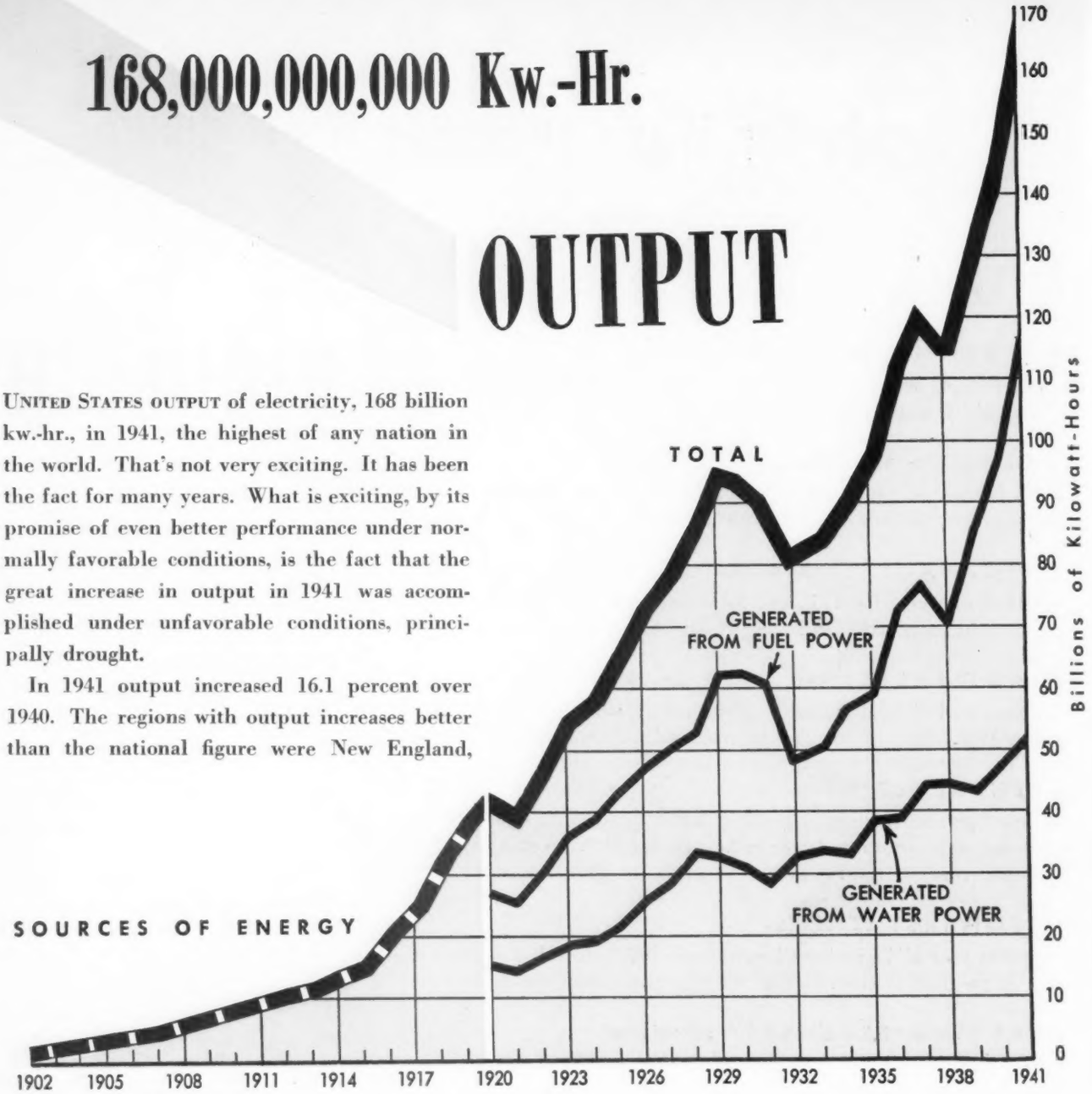
Operating systems near 800 mark, with 350,000 miles of line, 47 generating plants of 52,000-kw. total capacity; nearly half-billion funds allotted.

168,000,000,000 Kw.-Hr.

OUTPUT

UNITED STATES OUTPUT of electricity, 168 billion kw.-hr., in 1941, the highest of any nation in the world. That's not very exciting. It has been the fact for many years. What is exciting, by its promise of even better performance under normally favorable conditions, is the fact that the great increase in output in 1941 was accomplished under unfavorable conditions, principally drought.

In 1941 output increased 16.1 percent over 1940. The regions with output increases better than the national figure were New England,



SOURCE AND DISPOSAL OF ENERGY

(In Millions of Kw.-Hr.)

Year	Generated from		Total Generation	Add Imports from Canada	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
	Fuel Power	Water Power						
1928	53,169	33,389	86,558	1,151	6,879	80,830	13,842	66,988
1929	62,734	33,191	95,925	962	6,610	90,277	14,983	75,294
1930	62,914	31,738	94,652	1,084	6,269	89,467	14,561	74,906
1931	61,149	29,580	90,729	794	5,459	86,064	14,162	71,902
1932	49,055	33,322	82,377	446	5,248	77,575	13,864	63,711
1933	50,678	34,058	84,736	613	4,910	80,439	14,523	65,916
1934	57,093	33,713	90,806	893	5,499	86,200	15,118	71,082
1935	59,430	39,034	98,464	901	5,669	93,696	16,100	77,596
1936	72,665	39,516	112,181	1,054	5,826	107,409	17,365	90,044
1937	77,348	44,489	121,837	1,733	6,428	117,142	17,783	99,359
1938	71,847	44,834	116,681	1,867	6,990	111,558	17,826	93,731
1939	86,314	44,022	130,336	1,900	7,734	124,502	18,735	105,768
1940	97,232	47,753	144,985	937	7,268	138,654	20,011	118,643
1941*	115,600	52,400	168,000	900	5,760	163,140	22,800	140,340

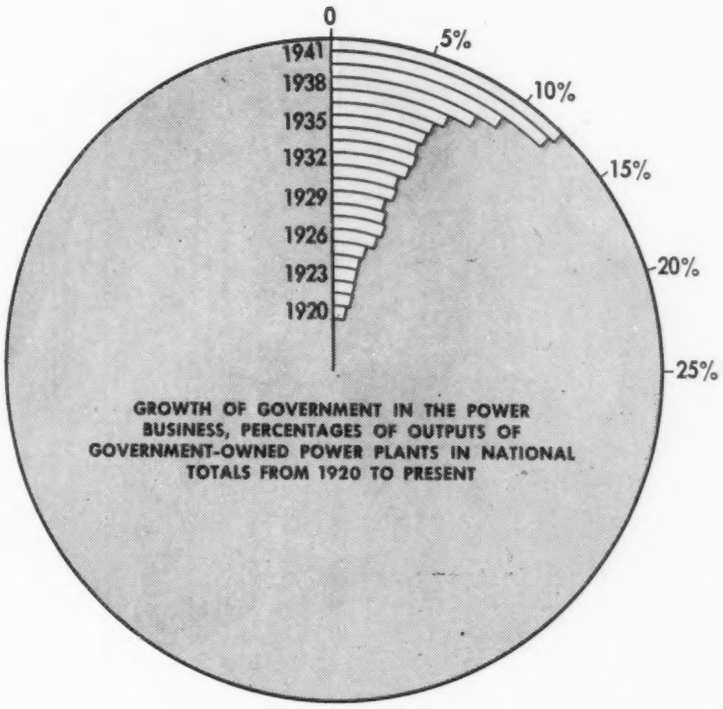
Sources: Federal Power Commission and Edison Electric Institute. * Estimated.

PRODUCTION OF ELECTRIC ENERGY BY OWNERSHIP

(In Millions of Kw.-Hr.)

Year	Privately Owned				Government Owned		
	Electric Utilities	Mining and Mfg.	Railways	Sub-total	Local†	Federal	Sub-total
1928	78,207	735	3,029	81,971	4,230	356	4,587
1929	87,514	780	2,965	91,259	4,367	300	4,667
1930	86,108	790	2,750	89,648	4,538	465	5,003
1931	82,597	789	2,590	85,975	4,257	497	4,754
1932	74,488	596	2,388	77,472	4,460	445	4,905
1933	76,668	740	2,256	79,664	4,614	459	5,072
1934	82,079	1,193	2,355	85,627	4,822	357	5,179
1935	89,330	831	2,346	92,506	5,403	555	5,958
1936	102,293	667	2,198	105,159	5,950	1,072	7,023
1937	110,464	784	2,140	113,388	6,606	1,843	8,449
1938	104,090	857	2,012	106,959	6,693	3,029	9,722
1939	115,078	851	1,843	117,772	7,088	5,476	12,564
1940	125,411	908	1,323	127,642	8,758	8,584	17,342
1941*	145,300	.....	.....	147,300	.....	.....	20,700

Source: Federal Power Commission. * Estimated. † Includes cooperatives.



GROWTH OF GOVERNMENT IN THE POWER BUSINESS, PERCENTAGES OF OUTPUTS OF GOVERNMENT-OWNED POWER PLANTS IN NATIONAL TOTALS FROM 1920 TO PRESENT

East North Central, South Atlantic, West South Central, East South Central. Mountain States, with 10 percent, showed the smallest increase; East South Central, with 19.2 percent, the largest.

Water power, despite rapid governmental additions to that form of capacity, still provides less than one-third of the total output. The Pacific states contributed twice as much hydro output as any other region. Phenomenal increases, 34 and 53 percent respectively, were made in fuel power output in the South Atlantic and East South Central states.

Government-owned facilities produced 12.4 percent of the total national output, an increase of 2 percent over 1940. They represent 15.9 percent of 1941 capacity.

ENERGY PRODUCTION BY REGIONS

(In Millions of Kw.-Hr.)

Region	1938			1939			1940			1941*		
	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total
N.E.	4,053	3,312	7,365	5,475	2,876	8,351	6,195	2,773	8,968	7,800	2,700	10,500
M.A.	21,643	8,295	29,938	25,635	7,335	32,970	28,662	7,721	36,383	33,900	7,400	41,300
E.N.C.	23,386	3,030	26,416	27,113	2,883	29,996	30,754	2,858	33,612	36,200	3,300	39,500
W.N.C.	5,454	2,099	7,553	5,994	1,865	7,859	6,787	1,694	8,481	6,900	2,900	9,800
S.A.	7,369	5,808	13,177	9,628	5,562	15,190	11,865	5,752	17,617	15,900	5,000	20,900
E.S.C.	1,637	4,143	5,780	1,911	5,057	6,968	2,413	6,058	8,471	3,700	6,400	10,100
W.S.C.	6,155	239	6,394	6,740	239	6,979	7,114	319	7,433	8,000	800	8,800
Mountain	1,124	4,853	5,977	1,476	6,017	7,493	1,774	6,770	8,544	1,500	7,900	9,400
Pacific	1,025	13,056	14,081	2,343	12,188	14,531	1,665	13,808	15,473	1,700	16,000	17,700
U.S.	71,847	44,834	116,681	86,314	44,022	130,336	97,232	47,753	144,985	115,600	52,400	168,000

Source: Federal Power Commission. * Estimated.

168,000,000,000 Kw.-Hr.

OUTPUT

UNITED STATES OUTPUT of electricity, 168 billion kw.-hr., in 1941, the highest of any nation in the world. That's not very exciting. It has been the fact for many years. What is exciting, by its promise of even better performance under normally favorable conditions, is the fact that the great increase in output in 1941 was accomplished under unfavorable conditions, principally drought.

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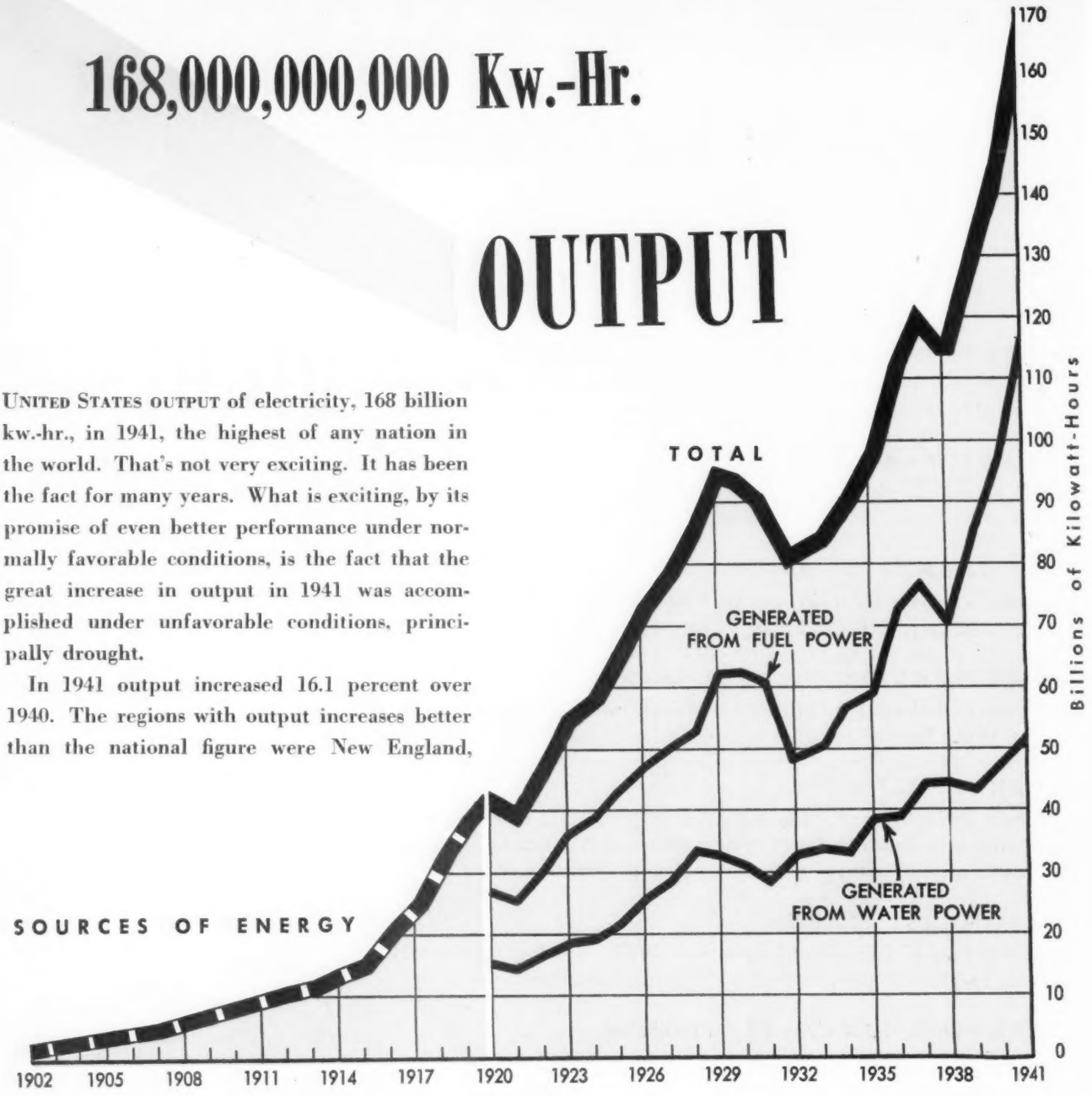

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1929	62,734	33,191	95,925	962	6,610	90,277	14,983	75,294
1930	62,914	31,738	94,652	1,084	6,269	89,467	14,561	74,906
1931	61,149	29,580	90,729	794	5,459	86,064	14,162	71,902
1932	49,055	33,322	82,377	446	5,248	77,575	13,864	63,711
1933	50,678	34,058	84,736	613	4,910	80,439	14,523	65,916
1934	57,093	33,713	90,806	893	5,499	86,200	15,118	71,082
1935	59,430	39,034	98,464	901	5,669	93,696	16,100	77,596
1936	72,665	39,516	112,181	1,054	5,826	107,409	17,365	90,044
1937	77,348	44,489	121,837	1,733	6,428	117,142	17,783	99,359
1938	71,847	44,834	116,681	1,867	6,990	111,558	17,826	93,731
1939	86,314	44,022	130,336	1,900	7,734	124,502	18,735	105,768
1940	97,232	47,753	144,985	937	7,268	138,654	20,011	118,643
1941*	115,600	52,400	168,000	900	5,760	163,140	22,800	140,340

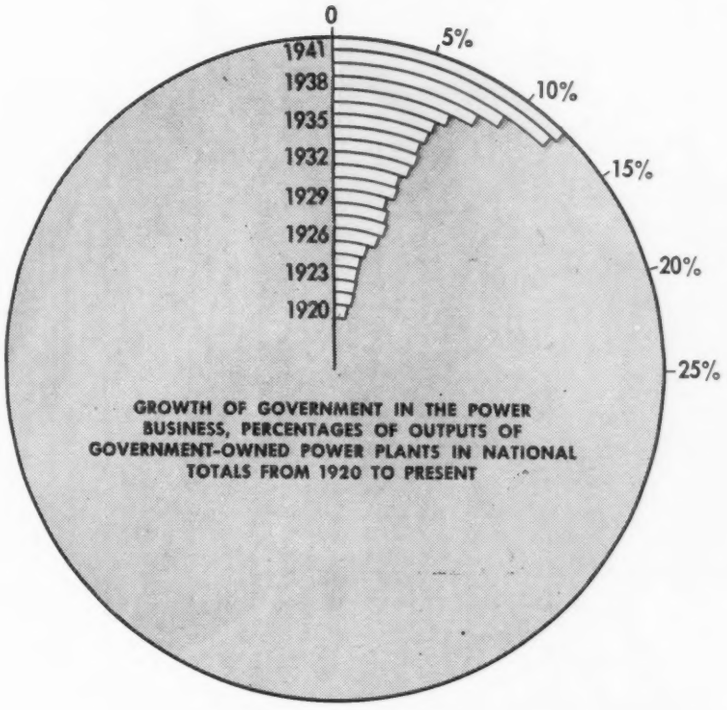
Sources: Federal Power Commission and Edison Electric Institute. * Estimated.

PRODUCTION OF ELECTRIC ENERGY BY OWNERSHIP

(In Millions of Kw.-Hr.)

Year	Privately Owned				Government Owned		
	Electric Utilities	Mining and Mfg.	Railways	Sub-total	Local†	Federal	Sub-total
1928	78,207	735	3,029	81,971	4,230	356	4,587
1929	87,514	780	2,965	91,259	4,367	300	4,667
1930	86,108	790	2,750	89,648	4,538	465	5,003
1931	82,597	789	2,590	85,975	4,257	497	4,754
1932	74,488	596	2,388	77,472	4,460	445	4,905
1933	76,668	740	2,256	79,664	4,614	459	5,072
1934	82,079	1,193	2,355	85,627	4,822	357	5,179
1935	89,330	831	2,346	92,506	5,403	555	5,958
1936	102,293	667	2,198	105,159	5,950	1,072	7,023
1937	110,464	784	2,140	113,388	6,606	1,843	8,449
1938	104,090	857	2,012	106,959	6,693	3,029	9,722
1939	115,078	851	1,843	117,772	7,088	5,476	12,564
1940	125,411	908	1,323	127,642	8,758	8,584	17,342
1941*	145,300	.....	.....	147,300	.....	.....	20,700

Source: Federal Power Commission. * Estimated. † Includes cooperatives.



GROWTH OF GOVERNMENT IN THE POWER BUSINESS, PERCENTAGES OF OUTPUTS OF GOVERNMENT-OWNED POWER PLANTS IN NATIONAL TOTALS FROM 1920 TO PRESENT

East North Central, South Atlantic, West South Central, East South Central. Mountain States, with 10 percent, showed the smallest increase; East South Central, with 19.2 percent, the largest.

Water power, despite rapid governmental additions to that form of capacity, still provides less than one-third of the total output. The Pacific states contributed twice as much hydro output as any other region. Phenomenal increases, 34 and 53 percent respectively, were made in fuel power output in the South Atlantic and East South Central states.

Government-owned facilities produced 12.4 percent of the total national output, an increase of 2 percent over 1940. They represent 15.9 percent of 1941 capacity.

ENERGY PRODUCTION BY REGIONS

(In Millions of Kw.-Hr.)

Region	1938			1939			1940			1941*		
	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total	Fuel Power	Water Power	Total
N.E.	4,053	3,312	7,365	5,475	2,876	8,351	6,195	2,773	8,968	7,800	2,700	10,500
M.A.	21,643	8,295	29,938	25,635	7,335	32,970	28,662	7,721	36,383	33,900	7,400	41,300
E.N.C.	23,386	3,030	26,416	27,113	2,883	29,996	30,754	2,858	33,612	36,200	3,300	39,500
W.N.C.	5,454	2,099	7,553	5,994	1,865	7,859	6,787	1,694	8,481	6,900	2,900	9,800
S.A.	7,369	5,808	13,177	9,628	5,562	15,190	11,865	5,752	17,617	15,900	5,000	20,900
E.S.C.	1,637	4,143	5,780	1,911	5,057	6,968	2,413	6,058	8,471	3,700	6,400	10,100
W.S.C.	6,155	239	6,394	6,740	239	6,979	7,114	319	7,433	8,000	800	8,800
Mountain	1,124	4,853	5,977	1,476	6,017	7,493	1,774	6,770	8,544	1,500	7,900	9,400
Pacific	1,025	13,056	14,081	2,343	12,188	14,531	1,665	13,808	15,473	1,700	16,000	17,700
U.S.	71,847	44,834	116,681	86,314	44,022	130,336	97,232	47,753	144,985	115,600	52,400	168,000

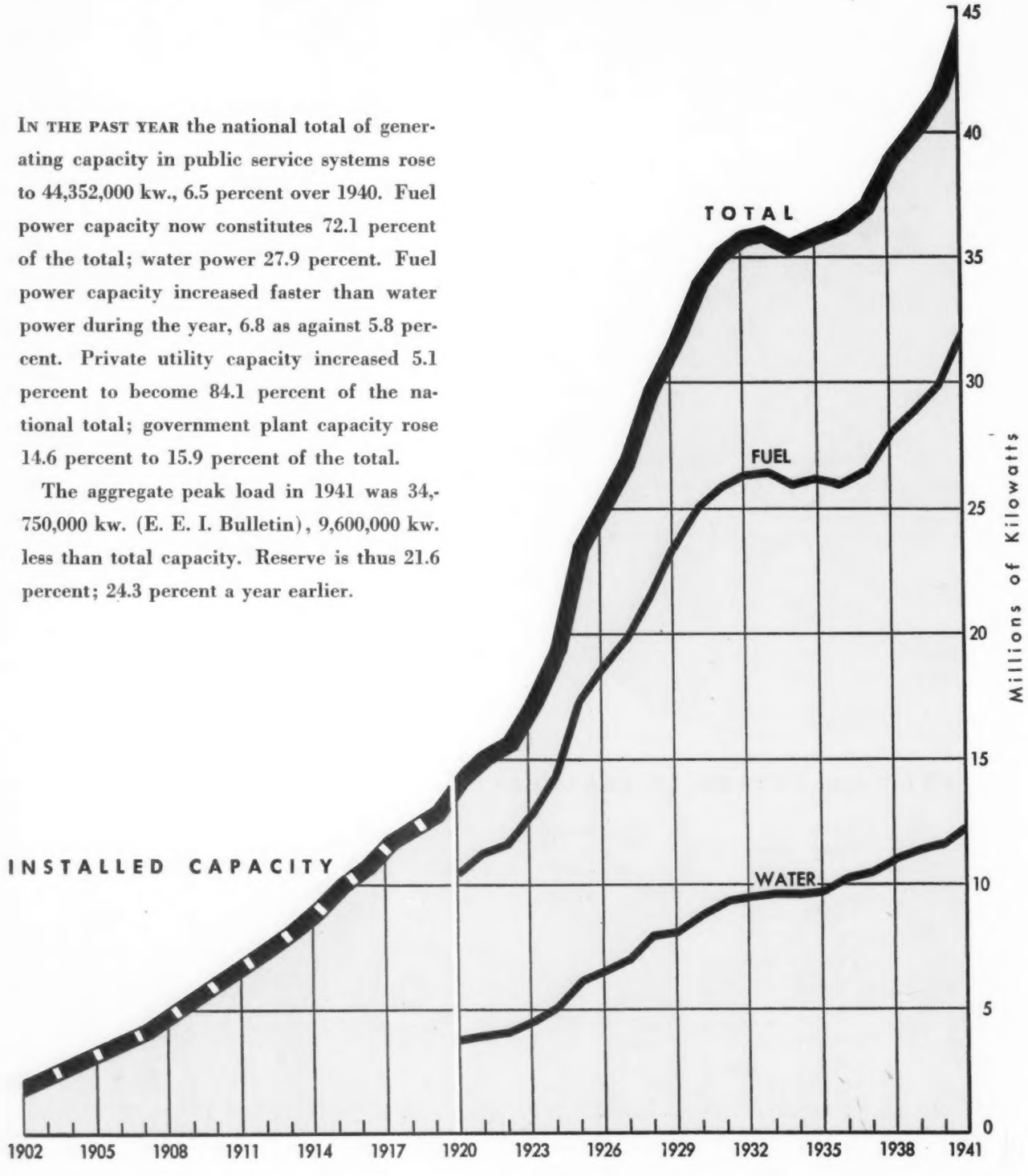
Source: Federal Power Commission. * Estimated.

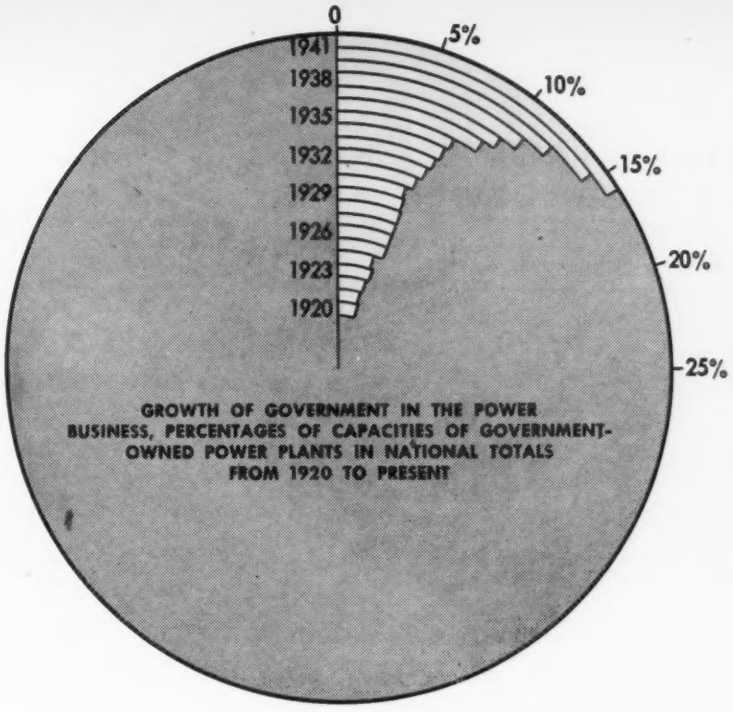
44,352,000 Kw.

CAPACITY

IN THE PAST YEAR the national total of generating capacity in public service systems rose to 44,352,000 kw., 6.5 percent over 1940. Fuel power capacity now constitutes 72.1 percent of the total; water power 27.9 percent. Fuel power capacity increased faster than water power during the year, 6.8 as against 5.8 percent. Private utility capacity increased 5.1 percent to become 84.1 percent of the national total; government plant capacity rose 14.6 percent to 15.9 percent of the total.

The aggregate peak load in 1941 was 34,750,000 kw. (E. E. I. Bulletin), 9,600,000 kw. less than total capacity. Reserve is thus 21.6 percent; 24.3 percent a year earlier.





GROWTH OF GOVERNMENT IN THE POWER BUSINESS, PERCENTAGES OF CAPACITIES OF GOVERNMENT-OWNED POWER PLANTS IN NATIONAL TOTALS FROM 1920 TO PRESENT

INSTALLED CAPACITY

(In Thousands of Kw.)

Year	Type of Prime Mover		
	Fuel	Water	Total
1928.....	21,653	8,061	29,714
1929.....	23,456	8,166	31,622
1930.....	25,114	8,941	34,055
1931.....	25,925	9,445	35,370
1932.....	26,408	9,583	35,991
1933.....	26,507	9,736	36,243
1934.....	26,049	9,742	35,791
1935.....	26,279	9,795	36,074
1936.....	26,128	10,436	36,564
1937.....	26,558	10,577	37,135
1938.....	27,976	11,066	39,042
1939.....	28,903	11,415	40,318
1940.....	29,964	11,675	41,639
1941*..	31,996	12,356	44,352

Source: Federal Power Commission. * Estimated.

GENERATING CAPACITY BY OWNERSHIP

(In Thousands of Kw.)

Year	Privately Owned				Government-Owned		
	Electric Utilities	Mining and Mfg.	Railways	Sub-total	Local†	Federal	Sub-total
1928.....	25,990	445	1,464	27,900	1,602	213	1,814
1929.....	27,953	420	1,363	29,736	1,673	214	1,887
1930.....	30,285	438	1,232	31,956	1,873	226	2,099
1931.....	31,498	431	1,240	33,170	1,969	230	2,200
1932.....	32,033	388	1,216	33,638	2,122	232	2,354
1933.....	32,163	458	1,198	33,819	2,191	232	2,423
1934.....	31,547	449	1,223	33,220	2,283	288	2,571
1935.....	31,820	449	1,190	33,459	2,316	300	2,615
1936.....	31,787	447	1,036	33,270	2,492	803	3,295
1937.....	31,958	494	1,021	33,472	2,829	832	3,662
1938.....	33,246	559	991	34,796	3,090	1,156	4,246
1939.....	33,908	559	896	35,363	3,304	1,650	4,955
1940.....	34,399	603	499	35,501	4,195	1,944	6,138
1941*.....	36,239	605	476	37,320	.....	.....	7,032

Source: Federal Power Commission. * Estimated. † Includes cooperatives.

GENERATING CAPACITY BY REGIONS

(In Thousands of Kw.)

Region	1938			1939			1940			1941*		
	Fuel	Water	Total	Fuel	Water	Total	Fuel	Water	Total	Fuel	Water	Total
N.E.....	2,110	843	2,953	2,177	852	3,029	2,187	876	3,063	2,304	875	3,179
M.A.....	8,019	1,570	9,589	8,175	1,571	9,746	8,281	1,597	9,878	8,828	1,602	10,430
E.N.C.....	8,033	709	8,742	8,360	710	9,070	8,773	716	9,489	9,482	718	10,200
W.N.C.....	2,511	532	3,043	2,626	532	3,158	2,777	539	3,316	2,839	547	3,386
S.A.....	2,652	1,986	4,638	2,782	2,061	4,843	3,031	2,140	5,171	3,399	2,164	5,563
E.S.C.....	786	1,164	1,950	780	1,221	2,001	778	1,366	2,144	853	1,432	2,285
W.S.C.....	1,787	139	1,926	1,902	139	2,041	1,951	153	2,104	1,977	279	2,256
Mountain.....	568	1,382	1,950	576	1,581	2,157	605	1,612	2,217	678	1,777	2,455
Pacific.....	1,510	2,741	4,251	1,525	2,748	4,273	1,578	2,675†	4,253	1,636	2,963	4,599
U.S.....	27,976	11,066	39,042	28,903	11,415	40,318	29,964	11,675	41,639	31,996	12,356	44,352

Source: Federal Power Commission. * Estimated. † Includes a reduction of 131,000 kw. in rerating equipment from kva. to kw. basis.

GENERATOR RATING—CENTRAL STATIONS, MUNICIPAL, RAILWAY AND OTHER UTILITY POWER PLANTS

Preliminary as of November 1, 1941

Division and State	No. of Companies*	No. of Plants	Total Capacity Kilowatts	Generator Capacity in Kilowatts of Plants Operated by									
				One Type of Prime Mover						Combination of Two or More Types			
				Water Power		Steam Power		Internal Combustion Engines		Total	Water Power	Steam Power	Internal Comb. Engines
				Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Capacity	Capacity	Capacity
United States	1,786	3,872	43,491,371	1,399	11,949,170	1,124	29,777,436	1,132	846,276	217	918,489	266,683	504,098	147,708
New England	144	327	3,143,798	223	856,009	70	2,149,425	13	15,163	21	123,201	17,557	103,180	2,464
Maine	26	79	290,086	61	214,596	8	70,890	5	1,334	5	3,266	1,331	800	1,135
New Hampshire	14	53	315,375	44	232,085	4	61,500	1	775	4	21,015	1,710	18,930	375
Vermont	25	70	178,014	60	164,962	4	9,600	1	492	5	2,960	1,010	1,750	200
Massachusetts	54	77	1,367,252	32	151,356	35	1,132,495	4	8,241	6	75,160	12,706	61,700	754
Rhode Island	6	11	278,021	5	3,350	5	274,450	1	221	0	0	0	0	0
Connecticut	19	37	715,050	21	89,660	14	600,490	1	4,100	1	20,800	800	20,000	0
Middle Atlantic	141	394	10,297,374	213	1,481,050	140	8,622,567	25	33,627	16	160,130	118,231	37,950	3,949
New York	72	243	5,825,233	175	1,162,990	49	4,632,000	9	19,668	10	10,575	4,496	2,450	3,629
New Jersey	15	25	1,330,487	4	6,700	15	1,312,450	4	3,817	2	7,520	400	7,000	120
Pennsylvania	54	126	3,141,654	34	311,360	76	2,678,117	12	10,142	4	142,035	113,335	28,500	200
East North Cent.	323	657	9,850,745	267	706,096	263	8,910,905	88	84,062	39	149,682	12,146	106,565	30,971
Ohio	72	107	2,634,989	6	11,525	82	2,605,368	17	14,881	2	3,215	600	2,490	125
Indiana	56	90	1,394,961	21	35,494	53	1,332,075	15	15,392	1	12,000	0	1,300	10,700
Illinois	66	96	2,697,228	10	46,627	62	2,563,717	19	16,604	5	70,280	1,745	65,125	3,410
Michigan	63	186	2,109,902	119	346,678	32	1,716,500	22	24,160	13	22,564	4,137	7,075	11,352
Wisconsin	66	178	1,013,665	111	265,772	34	693,245	15	13,025	18	41,623	5,664	30,575	5,384
West North Cent.	473	823	3,348,902	118	508,436	206	2,383,163	448	298,246	51	159,057	38,177	83,454	37,426
Minnesota	76	142	704,307	41	154,951	45	501,155	40	26,566	16	21,635	2,678	7,254	11,703
Iowa	100	171	717,094	27	126,194	43	446,299	90	72,178	11	72,423	4,869	59,970	7,584
Missouri	68	107	850,199	7	158,345	32	638,905	65	51,535	3	1,414	25	388	1,001
North Dakota	17	41	93,848	0	0	16	84,838	24	7,786	1	1,224	0	500	724
South Dakota	39	63	87,742	6	4,095	8	48,850	46	27,172	3	7,625	0	3,512	4,113
Nebraska	88	163	370,224	30	58,630	30	222,586	89	43,317	14	45,691	29,945	5,650	10,096
Kansas	85	136	525,488	7	6,221	32	440,530	94	69,692	3	9,045	660	6,180	2,205
South Atlantic	170	408	5,518,382	148	2,116,834	135	3,142,273	105	73,889	20	185,386	47,328	128,862	9,196
Delaware	7	8	37,475	0	0	4	33,200	4	4,275	0	0	0	0	0
Maryland	14	29	750,319	3	271,385	12	469,025	13	8,084	1	1,825	0	300	1,525
Dist. of Columbia	2	3	307,400	1	2,400	2	305,000	0	0	0	0	0	0	0
Virginia	29	70	631,051	33	168,300	17	321,960	14	8,511	6	132,280	15,144	113,750	3,386
West Virginia	16	39	793,268	10	100,880	18	687,410	9	4,657	2	321	100	0	221
North Carolina	35	81	1,310,065	47	727,406	23	572,541	8	7,150	3	2,968	2,134	0	834
South Carolina	17	42	658,778	25	503,228	9	132,330	6	3,230	2	19,990	14,900	5,000	90
Georgia	16	56	586,888	26	329,042	22	235,350	4	1,424	4	21,072	14,850	5,312	910
Florida	34	80	443,138	3	14,193	28	385,457	47	36,558	2	6,930	200	4,500	2,230
East South Cent.	75	178	2,247,285	33	1,431,645	81	788,769	60	24,401	4	2,470	225	1,290	955
Kentucky	19	41	372,828	3	110,860	27	258,080	9	2,858	2	1,030	225	490	315
Tennessee	20	39	707,358	17	512,552	15	192,622	7	2,184	0	0	0	0	0
Alabama	12	46	1,103,397	13	808,233	20	289,320	12	5,104	1	740	0	500	240
Mississippi	24	52	63,702	0	0	19	48,747	32	14,255	1	700	0	300	400
West South Cent.	184	414	2,235,720	32	277,893	99	1,718,568	272	201,037	11	38,222	654	25,416	12,152
Arkansas	26	51	155,536	5	67,008	17	69,850	29	18,678	0	0	0	0	0
Louisiana	37	63	419,126	0	0	9	373,770	53	43,606	1	1,750	0	850	900
Oklahoma	58	102	428,920	3	58,800	23	314,698	72	51,832	4	3,590	424	516	2,650
Texas	63	198	1,232,138	24	152,085	50	960,250	118	86,921	6	32,882	230	24,050	8,602
Mountain	175	367	2,317,815	157	1,682,660	70	502,266	96	70,698	44	62,191	11,785	17,081	33,325
Montana	14	30	336,629	18	321,385	3	9,850	7	1,960	2	3,434	180	2,368	886
Idaho	18	49	263,054	37	256,714	2	650	4	1,729	6	3,961	2,710	0	1,251
Wyoming	29	42	88,488	10	47,772	16	32,960	10	4,189	6	3,567	2,080	677	810
Colorado	38	81	290,804	22	64,682	28	209,101	24	14,108	7	2,913	1,468	425	1,020
New Mexico	19	39	144,125	2	24,380	11	97,245	23	16,015	3	6,485	777	2,634	3,074
Arizona	23	47	516,083	13	375,575	7	86,210	19	26,103	8	28,195	40	8,477	19,678
Utah	26	66	169,216	48	88,802	3	66,250	6	4,184	9	9,980	3,990	0	5,990
Nevada	8	13	509,416	7	503,350	0	0	3	2,410	3	3,656	540	2,500	616
Pacific	101	304	4,531,350	208	2,888,547	60	1,559,500	25	45,153	11	38,150	20,580	300	17,270
Washington	33	71	1,133,130	50	908,180	13	217,500	7	7,340	1	110	30	0	80
Oregon	33	76	633,188	45	439,852	18	184,950	7	1,391	6	6,995	2,500	300	4,195
California	35	157	2,765,032	113	1,540,515	29	1,157,050	11	36,422	4	31,045	18,050	0	12,995

* Total includes 86 duplications because of companies operating in more than one state.
SOURCE: Federal Power Commission.

9,000,000 Kw.

NEW CAPACITY

IMMINENCE OF WAR and the coming of it have accelerated the increase in electricity production capacity. Not since 1928 has the electric utility industry added so much to its ability to serve the nation as in the year past. And in the present year, if the stringency of war permits, an even greater addition than in 1941 will be made to generating capacity. From the indications of today, the pace of increase will continue through 1943 into the next following years.

Electric utilities, including government projects, last year added 3,078,375 kw. in generating capacity to their systems, a record increase of almost 18 percent over 1941. Anticipating the need for electric energy in a nation at war, the utilities expect to install 3,618,404 kw. this year and have already planned installation of 5,071,695 kw. in 1943 and later. Thus the prospective increase in generating capacity for the immediately coming years amounts to nearly 9,000,000 kw. Assuming that conditions will allow it, one may say that in the next four years generating capacity in this country will increase 10,000,000 kw. or more.

Retirements and changes in ratings changed the gross addition figure to a net capacity increase of 2,712,000 kw. in 1941. Despite difficulties encountered in obtaining turbines, capacity additions made by

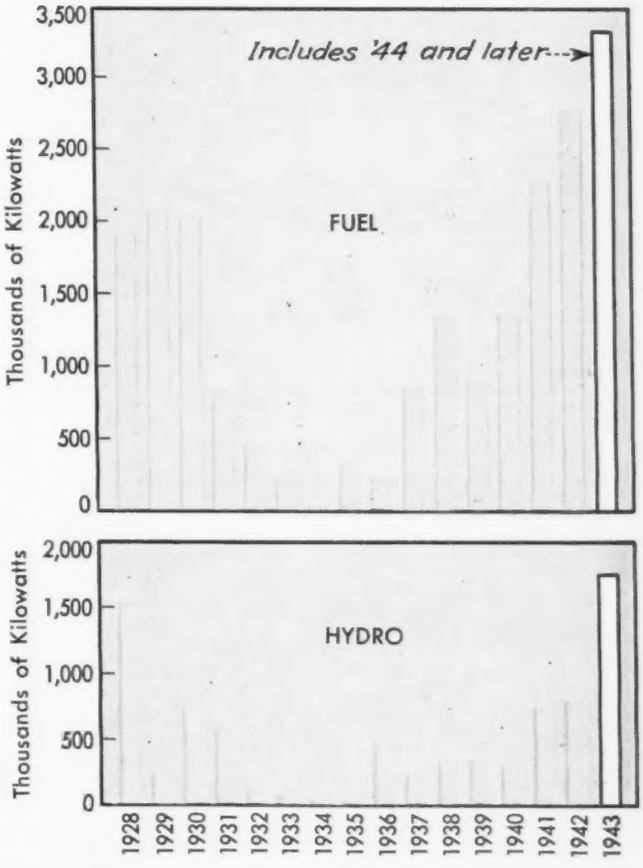
NEW CAPACITY ADDED EACH YEAR

as reported to Electrical World for the entire industry

Year	Kilowatts		
	Fuel	Hydro	Total
1928.....	1,935,500	†1,520,000	3,455,500
1929.....	2,081,085	†249,200	2,330,285
1930.....	2,040,947	748,480	2,789,427
1931.....	836,500	566,500	1,403,000
1932.....	466,300	126,155	592,455
1933.....	251,025	95,325	346,350
1934.....	52,805	41,900	94,705
1935.....	347,140	38,950	386,090
1936.....	231,828	‡489,865	721,093
1937.....	873,414	245,346	1,118,760
1938.....	1,350,303	345,605	1,695,808
1939.....	914,680	370,150	1,284,830
1940.....	1,361,094	332,016	1,693,110
1941.....	2,292,215	786,250	3,078,375
1942*.....	2,789,078	829,326	3,618,404
1943*.....	2,240,695	1,131,000	3,371,695
1944*§.....	1,080,000	620,000	1,700,000

† Kw. estimated; reported wholly or partly in hp.
‡ Including Boulder, 165,000; Norris, 100,000.
* Prospective. § Includes 1945 and later.

NEW GENERATING CAPACITY



GENERATING CAPACITY ADDED IN 1941

Steam

Private Companies	*Kw.*
Alabama Power	41,000
American Gas & Electric (Central System)	61,900
American Water Works & Electric	60,000
Atlantic City Electric	25,000
Brockton Edison	5,000
Central Illinois Light	35,000
Central Illinois Public Service	25,000
Cleveland Electric Illuminating	60,000
Commonwealth Edison & Subs	75,000
Consolidated Edison of N. Y. & Assoc.	170,000
Consolidated Gas, Electric Light & Power of Baltimore	57,500
Consumers Power	85,000
Connecticut Power	25,000
Detroit Edison	75,000
Duke Power	80,000
Duquesne Light	60,000
Eastern Shore Public Service	7,500
Florida Power & Light	30,000
Georgia Power	100,000
Indianapolis Power & Light	37,500
Interstate Power	1,000
Iowa Electric Light & Power	15,000
Kentucky Utilities	12,500
Louisville Gas & Electric	25,000
Marion Reserve Power	12,500
Metropolitan Edison	20,000
Missouri Power & Light	5,000
Moline-Rock Island Mfg	21,430
Mountain States Power	7,500
Mt. Carmel Public Utility & Service	1,500
New England Power & Mass. Util. Assoc. & Subs	40,000
New Jersey Power & Light	55,000
Newport Electric	4,000
Niagara Hudson System	80,000
Northern States Power (Minn.) & Subs.	50,000
Ohio Public Service	37,500
Pacific Gas & Electric	100,000
Pennsylvania Power & Light	15,000
Philadelphia Electric & Subs	50,000
Public Service Electric & Gas	75,000
Public Service of Colorado	25,000
Public Service of Indiana	50,000
Public Service of Oklahoma	7,500
Rochester Gas & Electric Corp	15,000
Salt River Valley Water Users' Assoc.	7,500
Southern Colorado Power	7,500
Texas Electric Service	10,000
Toledo Edison	50,000
United Illuminating	25,000
United Light & Power System	17,150
Virginia Electric & Power	40,000
Western Pennsylvania Group (Central U. S. Utilities)	35,000
Wisconsin Electric Power	35,000
Wisconsin Power & Light	30,000
Total	2,097,980

Municipal and Other Public Plants	
Alexandria, La	7,500
Atlantic, Iowa	3,500
Burbank, Calif	10,000
Cleveland, Ohio	37,500
Crawfordsville, Ind	11,500
Decatur, Ind	5,000
Dyersburg, Tenn	3,500
East Braintree, Mass	7,000
Eugene, Oregon	7,500
Fort Bend Utilities	1,000
Fort Wayne, Ind	15,000
Glendale, Calif	20,000
Greenville, N. C	9,250
Lakeland, Fla	5,000
Manitowoc, Wis	10,000
Marshall, Mo	2,500
Salina, Ohio	2,000
Springfield, Ill	15,000
Wilson, N. C	7,500
Total	180,250

Hydro

Private Companies	*Kw*
Bangor Hydro Electric	1,600
Maine Public Service	1,500
Moline-Rock Island Mfg	3,600
New Jersey Power & Light	150
Puget Sound Power & Light	11,600
Total	18,450

Municipal and Other Public Plants	
Bonneville	108,000
Brazos River Conservation & Reclamation Dist	20,000
Bureau of Reclamation (Parker Dam)	90,000
Cedar Falls, Iowa	1,200
Grand Coulee	216,000
Logan City, Utah	1,400
Lower Colorado River Authority	67,500
Los Angeles, Calif	82,500
Nebraska Public Power System	54,000
Priest Rapids Irrigation Dist	1,200
South Carolina Public Service Authority	61,200
Tennessee Valley Authority	64,800
Total	767,800

Internal Combustion

Private Companies	
Central Power & Light	447
Gulf Public Service	1,000
Louisiana Ice & Electric Co., Inc	1,500
Mountain States Power	430
Oklahoma Gas & Electric	764
Sierra Pacific Power	148
Sioux City Gas & Electric & Iowa Public Service System	1,250
Utah Power & Light & Western Colorado Power	250
West Texas Utilities	350
Total	6,139

Municipal and Other Public Plants	
Freeport, N. Y	2,000
Keystone Heights, Fla	946
Logan City, Utah	4,810
Total	7,756

TOTALS FOR 1941

Kilowatts	Private Companies	Municipal and Federal	Total
Steam	2,097,980	180,250	2,278,230
Hydro	18,450	767,800	786,250
Int. Comb'n.	6,139	7,756	13,895
Total	2,122,569	955,806	3,078,375

private utilities in 1941 amounted to 93 percent of what they reported as planned in last year's Annual Statistical Number of ELECTRICAL WORLD. These difficulties carry over into 1942 and probably will continue into later years.

Of the approximately 9,000,000 kw. of new capacity reported as planned for the next coming years, private utilities account for about 68 percent, with municipal and other government-owned plants promising the remainder. Fuel power, steam turbines mostly, covers some 70 percent of this capacity addition program.

Noteworthy capacity additions completed during 1941 include 170,000 kw. for the Consolidated Edison system, 100,000 kw. for Georgia Power and 100,000 kw. for Pacific Gas & Electric. Of the hydro addi-

tions in 1941, Bonneville, Grand Coulee and Parker Dam accounted for better than half of the approximate 800,000 kw. total.

In prospect for 1942 and later there are the capacity programs of American Gas & Electric (Central System), which aggregates nearly 500,000 kw.; Pacific Gas & Electric, with 400,000 kw., equally divided between fuel and hydro; Philadelphia Electric, with almost 400,000 kw., and Commonwealth Edison, with almost as much; Union Electric, with 240,000 kw.; Public Service Electric & Gas, with 200,000; Detroit Edison, with 150,000 kw., and Alabama Power, with 100,000 kw., to single out some of the larger additions. It is to be noted that the private company additions are being made in the areas where defense plants have been and are likely to be built.

Extensive hydro additions are on the agenda of the federal projects for 1942 and later. Tennessee Valley Authority, for example, reports almost 800,000 kw., plus an 180,000-kw. steam addition in 1942. Bonneville shows nearly 300,000 kw. additions in prospect, with Grand Coulee adding better than 400,000 kw.

GENERATING CAPACITY TO BE ADDED IN 1942

Steam

Private Companies	*Kw.*
American Gas & Electric (Central System)	300,600
American Water Works & Electric	40,000
Arkansas Utilities	4,000
Atlantic City Electric	20,000
Boston Edison	68,750
Carolina Power & Light	60,000
Central Illinois Electric & Gas	2,000
Central Maine Power	20,000
Central Power & Light	15,000
Cleveland Electric Illuminating	60,000
Commonwealth Edison & Subs	159,500
Columbia Gas & Electric Corp. & Subs.	95,000
Connecticut Light & Power	45,000
Consolidated Edison of N. Y. & Assoc.	50,000
Consolidated Gas Electric Light & Power of Baltimore	50,000
Consumers Power	50,000
Detroit Edison	75,000
Duke Power	40,000
Duquesne Light	60,000
Edison Sault Electric	3,000
Florida Power Corp	25,000
Georgia Power	40,000
Hartford Electric Light	45,000
Holyoke Water Power	1,500
Interstate Power	18,000
Iowa Electric Light & Power	7,500
Long Island Lighting	55,000
Louisville Gas & Electric	50,000
Lynn Gas & Electric	10,000
Missouri Power & Light	5,000
Montaup Electric	20,000
New Bedford Gas & Edison Light	7,500
New England Power & Mass. Util. Assoc. & Subs	20,000
New Hampshire Gas & Electric	7,500
New York State Electric & Gas	20,000
Niagara Hudson System	80,000
Northwestern Public Service	7,500
Ohio Edison	35,000
Otter Tail Power	5,000
Pennsylvania Power & Light	31,250
Philadelphia Electric & Subs	80,000
Potomac Electric Power	50,000
Public Electric Light	4,000
Public Service Electric & Gas	150,000
Public Service of Oklahoma	7,500
Salt River Valley Water Users' Assoc.	15,000
San Diego Gas & Electric	35,000
Southern Indiana Gas & Electric	20,000
St. Joseph Railway Light, Heat & Power	6,250
Superior Water, Light & Power	12,500
Tampa Electric	15,000
Texas-New Mexico Utilities	7,500
Union Electric of Missouri & Subs	160,000
United Light & Power System	35,710
Virginia Electric & Power	4,000
Virginia Public Service	15,000
Wisconsin Electric Power	80,000
Wisconsin Public Service	30,000
Total	2,436,060

Municipal and Other Public Plants	
Burbank, Calif.	10,000
Clay Center, Kan.	1,500
Colorado Springs, Col.	5,000
Fairmont, Minn.	4,000
Fort Wayne, Ind.	11,000
Gainesville, Fla.	5,000
Hinsdale, Ill.	1,400
Holyoke, Mass.	6,250
Los Angeles, Calif.	65,000
Marshfield, Wis.	4,000
Martins Ferry, Ohio	3,000
Reading, Pa.	2,500
Richmond, Ind.	15,000
South Haven, Mich.	5,000
Tennessee Valley Authority	180,000
Union Public Service	5,000
Vineland, N. J.	4,000
Watertown, S. D.	3,000
Total	330,650

Hydro

Private Companies	
Consolidated Water Power	8,750
Nantahala Power & Light	43,200
Pacific Gas & Electric	38,500
Southern California Edison	82,500
Washington Water Power	3,126
Total	176,076

Municipal and Other Public Plants	
Boonville	54,000
Grand Coulee	108,000
Kaukauna, Wis.	2,400
Los Angeles, Calif.	82,500
South Carolina Public Service Authority	72,550
Tennessee Valley Authority	333,800
Total	653,250

Internal Combustion

Private Companies	
Consumers Public Service	250
Elko Lamoille Power	480
Gulf Public Service	1,000
Kansas Power	1,250
Sac County Electric	267
Sioux City Gas & Electric & Iowa Public Service System	731
Southeastern Indiana Power	8,000
Total	11,978

Municipal and Other Public Plants	
Bloomington, Ill.	3,000
Hudson, Mass.	2,100
Logan, Utah	1,500
Lubbock, Texas	2,250
Rockville Centre, N. Y.	1,540
Total	10,390

TOTALS FOR 1942

Kilowatts	Private Companies	Municipal and Federal	Total
Steam	2,436,060	330,650	2,766,710
Hydro	176,076	653,250	829,326
Int. Comb'n.	11,978	10,390	22,368
Total	2,624,114	994,290	3,618,404

CAPACITY TO BE ADDED IN 1943 (PROSPECTIVE)

Steam

Private Companies	*Kw.*
Alabama Power	100,000
American Gas & Electric (Central System)	85,000
Arkansas Power & Light	30,000
Boston Edison	50,000
Central Illinois Electric & Gas	20,000
Central Illinois Public Service	25,000
Central Maine Power	20,000
Central Power & Light	15,000
Cleveland Electric Illuminating	50,000
Commonwealth Edison & Subs	200,000
Columbia Gas & Electric & Subs	30,000
Consumers Power	50,000
Dallas Power & Light	25,000
Detroit Edison	75,000
Duke Power	40,000
Georgia Power	40,000
Gulf Public Service	5,000
Gulf States Utilities	20,000
Houston Lighting & Power	30,000
Indianapolis Power & Light	37,500
Jersey Central Power & Light	25,000
Kentucky Utilities	25,000
Lynn Gas & Electric	10,000
Metropolitan Edison	35,000
Minnesota Power & Light	25,000
Missouri Power & Light	5,000
New Jersey Power & Light	35,000
New Orleans Public Service	30,000
New York State Electric & Gas	35,000
Northern States Power (Minn.) & Subs.	73,000
Ohio Edison	35,000
Oklahoma Gas & Electric	20,000
Pacific Gas & Electric	125,000
Pennsylvania Power & Light	25,000
Philadelphia Electric & Subs	150,000
Potomac Electric Power	50,000
Public Service of New Hampshire	10,000
Public Service Electric & Gas	50,000
Rochester Gas & Electric	25,000
Union Electric of Missouri & Subs	80,000
United Illuminating	25,000
United Light & Power System	130,714
Virginia Electric & Power	15,000
Virginia Public Service	25,000
Western Pennsylvania Group (Central U. S. Utilities)	25,000
Total	2,036,214

Municipal and Other Public Plants	
Burbank, Calif	10,000
Dover, Ohio	5,000
Fremont, Nebr	5,000
Glendale, Calif	20,000
High Point, N. C.	8,000
Kansas City, Kan	30,000
Lansing, Mich	25,000
Los Angeles, Calif	65,000
Portland, Ind	5,000
Rushville, Ind	3,500
Spencer, Iowa	3,000
Stillwater, Okla	4,000
Virginia, Minn	2,500
Total	186,000

Hydro

Private Companies	*Kw.*
Bangor Hydro-Electric	6,000
Central Vermont Public Service	7,000
Pacific Gas & Electric	160,000
Total	173,000

Municipal and Other Public Plants	
Bonneville	216,000
Bureau of Reclamation (Parker Dam)	30,000
Grand Coulee	324,000
High Point, N. C.	21,000
Holyoke, Mass	600
Tacoma, Wash	90,000
Tennessee Valley Authority	276,400
Total	958,000

Internal Combustion

Private Companies	
Arizona Edison	1,000
Central Electric & Telephone	750
Dakota Public Service	1,000
Iowa Electric Power & Light	5,000
Kansas Power	1,250
Sioux City Gas & Electric & Iowa Public Service System	981
Western Public Service	1,500
Total	11,481

Municipal and Other Public Plants	
Carthage, Mo	2,500
Hudson, Mass	3,000
Rochelle, Ill	1,500
Total	7,000

TOTALS FOR 1943 (PROSPECTIVE)

Kilowatts to be Added	Private Companies	Municipal and Federal	Total
Steam	2,036,214	186,000	2,222,214
Hydro	173,000	958,000	1,131,000
Int. Comb'n.	11,481	7,000	18,481
Total	2,220,695	1,151,000	3,371,695

GENERATING CAPACITY TO BE ADDED IN 1944 OR LATER (PROSPECTIVE)

Steam

Private Companies	*Kw.*	
American G. & E. (Central System)	85,000	
Connecticut Light & Power	45,000	
Consolidated G. E. L. & P (Balt.)	50,000	
Dakota Public Service	3,000	(1945)
Eastern Shore Public Service	7,500	
Gulf Power	20,000	
Iowa Electric Light & Power	15,000	
Kansas Power Co	7,500	
Long Island Lighting	80,000	(1946)
Louisiana Power & Light	35,000	
Mississippi Power	20,000	
Missouri Electric Power	5,000	(1945)
Montaup Electric	35,000	
Northern States Power (Minn.) & Subs	50,000	(1945)
Northwestern Public Service	7,500	(1949)
Pacific Gas & Electric	75,000	
Pennsylvania Edison	25,000	
Philadelphia Electric & Subs	150,000	
Potomac Electric Power	50,000	
Public Service of Indiana	85,000	
Public Service of Oklahoma	15,000	
San Diego Gas & Electric	50,000	
Sheridan County Electric	4,000	(1945)
Wisconsin Power & Light	20,000	
Wisconsin Public Service	30,000	(1945)
Total	969,500	

Municipal and Other Public Plants		
Chanute, Kan	5,000	(1947)
Fort Morgan, Col	2,500	(1945)
Nebraska Public Power System	50,000	(1945)
Norwalk, Ohio	5,000	
Ottawa, Kan	7,500	(1953)
Springfield, Ill	30,000	
Troy, Ohio	7,500	(1945)
Total	107,500	

Hydro

Private Companies	*Kw.*
Rockland Light & Power & Subs	10,000
Total	10,000

Municipal and Other Public Plants	
Bureau of Reclamation (Central Valley)	450,000
Tennessee Valley Authority	160,000
Total	610,000

Internal Combustion

Private Companies		
Dakota Public Service	1,000	(1946)
Northwestern Public Service	1,000	
Sac County Electric	1,000	(1945)
Total	3,000	

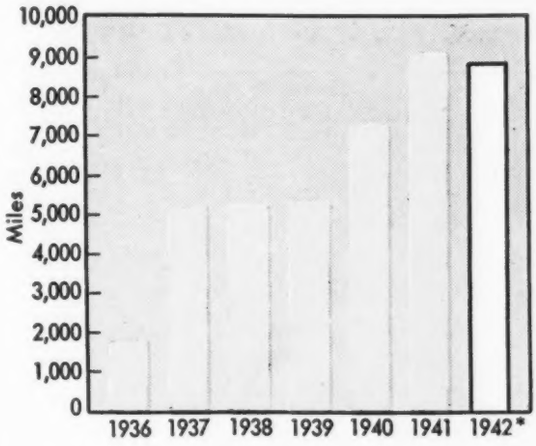
TOTALS FOR 1944 OR LATER (PROSPECTIVE)

Kilowatts to be Added	Private Companies	Municipal and Federal	Total
Steam	969,500	107,500	1,077,000
Hydro	10,000	610,000	620,000
Int. Comb'n.	3,000		3,000
Total	982,500	717,500	1,700,000

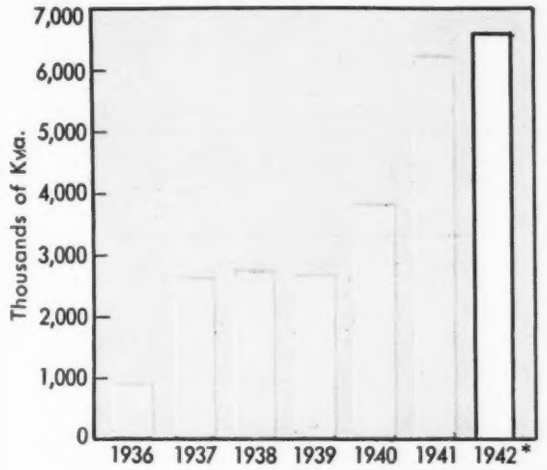
9,000 Miles; 6,000,000 Kva.

TRANSMISSION and SUBSTATIONS

NEW TRANSMISSION LINES



NEW SUBSTATION CAPACITY



To SERVE THE growing demands on industry made by war in 1942, electric utilities plan to add even more substation—as well as generating—capacity than in 1941 and to build nearly as much transmission mileage. It is to be noted in the tables that very substantial increases are planned in those regions for which fears of power shortage have been expressed.

Here, again, it must be remembered that new construction programs assume that the utilities will be able to get authorizations for their extensions and then to obtain the materials.

CONSTRUCTION OF SUBSTATIONS

(In Thousands of Kva.)

Region	1938	1939	1940	1941	1942*
New England	123	225	368	346	443
Middle Atlantic	347	269	667	1,442	1,580
East North Central	649	612	1,042	1,152	1,047
West North Central	199	280	292	297	813
South Atlantic	368	385	398	782	481
East South Central	430	387	235	592	625
West South Central	105	60	157	233	371
Mountain	106	77	125	212	63
Pacific	422	323	495	1,166	1,239
United States	2,749	2,618	3,779	6,222	6,662

Source: "Electrical World" Surveys. *Estimated.

CONSTRUCTION OF TRANSMISSION

(In Miles—11 Kv. and Up)

Region	1938	1939	1940	1941	1942*
New England	99	169	154	298	332
Middle Atlantic	361	680	568	925	965
East North Central	882	940	1,290	1,065	1,114
West North Central	295	340	543	456	1,200
South Atlantic	617	740	1,125	1,670	1,106
East South Central	810	535	544	690	873
West South Central	674	720	879	1,306	1,086
Mountain	305	840	765	952	462
Pacific	1,113	415	1,430	1,724	1,678
United States	5,156	5,379	7,298	9,086	8,816

Source: "Electrical World" Surveys. *Estimated.

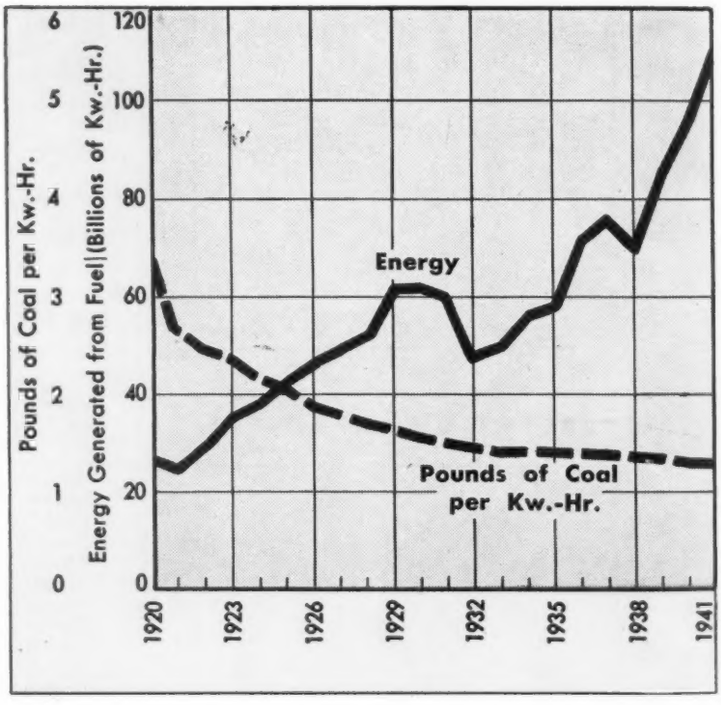
3,907 Kw.-Hr. per Kw. of Capacity

STATION ECONOMICS

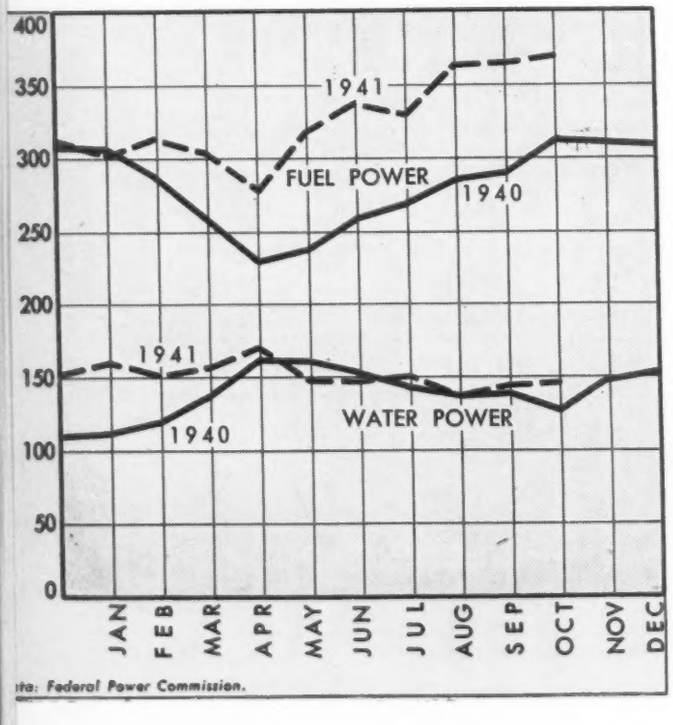
WAR DEMANDS AND DROUGHTS, necessitating the employment of older capacity for longer hours, were not enough in 1941 to increase the low figure of fuel economy, 1.35 lb. of coal per kilowatt-hour, set in 1940. These adverse factors did no more than offset the gain in economy from operation of new high efficiency plants. But this result would not have been possible were it not for the continuing development of more refined controls of station loading, of combustion processes and of other operating techniques.

The working hours of generating capacity are increasing. Fuel power capacity worked 3,731 more hours in 1941, more hours than in any of the past fourteen years. Hydro hours of operation

OUTPUT FROM FUEL AND FUEL USED

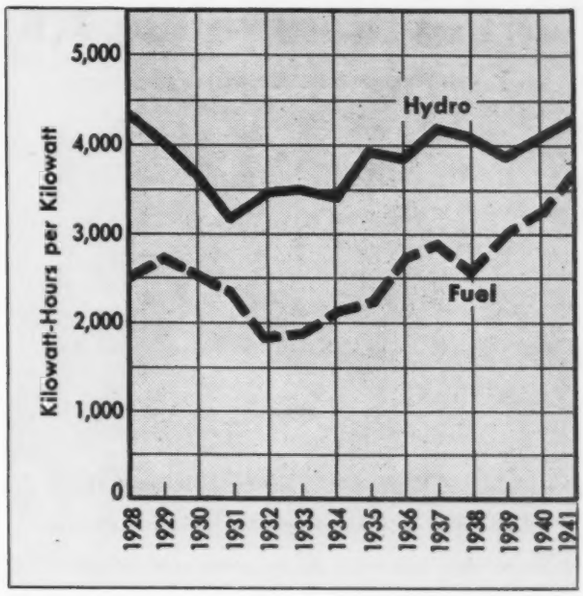


AVERAGE DAILY PRODUCTION OF ELECTRICAL ENERGY



Data: Federal Power Commission.

AVERAGE USE OF CAPACITY



OUTPUT FROM FUEL AND FUEL USED

Year	Energy Generated from Fuel† (Millions of Kw.-Hr.)	Fuel Consumed				
		Coal (Millions of Tons)	Oil (Millions of Bbl.)	Gas (Billions of Cu. Ft.)	Coal Equiv. (Millions of Tons)	Pounds of Coal per Kw.-Hr.†
1920..	27,228	42.94	10.47	21.86	46.15	3.39
1924..	38,806	37.56	16.64	48.47	42.69	2.20
1929..	62,295	44.93	10.19	112.62	52.64	1.69
1931..	60,791	38.71	8.13	139.27	47.11	1.55
1932..	48,931	30.30	7.97	107.84	36.70	1.50
1933..	50,546	30.58	9.95	102.73	37.15	1.47
1935..	59,176	34.16	11.38	125.24	43.20	1.46
1936..	72,188	42.03	14.12	156.08	51.99	1.44
1937..	76,883	44.77	14.14	171.27	55.14	1.43
1938..	71,525	40.21	13.08	170.69	50.56	1.41
1939..	85,800	46.22	17.42	191.13	59.51	1.39
1940..	96,609	53.40	16.77	183.16	65.14	1.35
1941*.	110,725	60.66	19.76	199.96	74.95	1.35

Source: Federal Power Commission.
† Output by use of wood not included.
* Twelve months ended October 31.

Thereafter steam power had to make up the decline in hydro output resulting from drought and in addition had to meet the rapidly growing demands of speeded-up industrial production. In October fuel power was providing 72 percent of the daily energy consumption, almost three times as much as was contributed by hydro.

nearly equaled the banner year of 1928, with 4,361 hours against 4,395. Had it not been for droughts hydro capacity would undoubtedly have outdone any previous year.

For the first time in its history, in September last year, the industry passed the figure of half a billion kilowatt-hours produced in one day. The peak day of hydro output came in April.

OUTPUT, CAPACITY, AVERAGE USE OF CAPACITY

Year	Energy Generated (Millions of Kw.-Hr.)			Generating Capacity at End of Year (Thousands of Kw.)			Output per Kw. of Ave. Cap. (Kw.-Hr.)		
	Fuel	Water	Total	Fuel	Water	Total	Fuel	Water	Total
1928...	53,169	33,389	86,558	21,653	8,061	29,714	2,560	4,395	3,051
1929...	62,734	33,191	95,925	23,456	8,166	31,622	2,781	4,091	3,128
1930...	62,914	31,738	94,652	25,114	8,941	34,055	2,591	3,710	2,882
1931...	61,149	29,580	90,729	25,925	9,445	35,370	2,396	3,218	2,614
1932...	49,055	33,322	82,377	26,408	9,583	35,991	1,875	3,502	2,309
1933...	50,678	34,058	84,736	26,507	9,736	36,243	1,915	3,526	2,346
1934...	57,093	33,713	90,806	26,049	9,742	35,791	2,173	3,462	2,521
1935...	59,430	39,034	98,464	26,279	9,795	36,074	2,271	3,996	2,740
1936...	72,665	39,516	112,181	26,128	10,436	36,564	2,773	3,906	3,089
1937...	77,348	44,489	121,837	26,558	10,577	37,135	2,936	4,234	3,306
1938...	71,847	44,834	116,681	27,976	11,066	39,042	2,635	4,143	3,063
1939...	86,314	44,022	130,336	28,903	11,415	40,318	3,035	3,916	3,285
1940...	97,232	47,753	144,985	29,964	11,675	41,639	3,303	4,137	3,538
1941*..	115,600	52,400	168,000	31,996	12,356	44,352	3,731	4,361	3,907

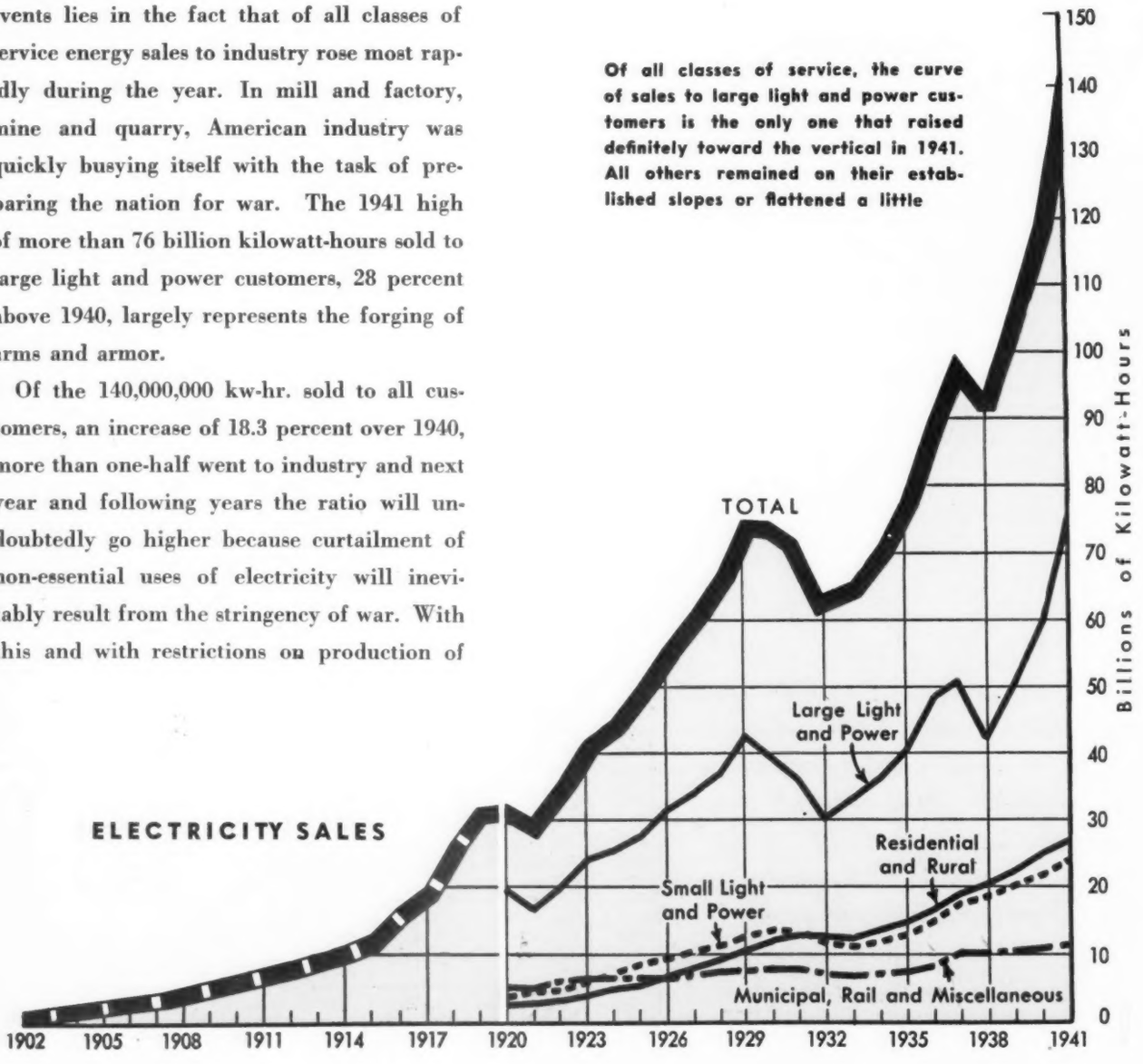
Source: Federal Power Commission.
* Estimated.

140,340,000,000 Kw.-Hr.

ENERGY SALES

WHEN THE NATION was forced into war at the end of 1941 the electric utility industry was completing the year of greatest supply of its service. Proof of connection between the two events lies in the fact that of all classes of service energy sales to industry rose most rapidly during the year. In mill and factory, mine and quarry, American industry was quickly busying itself with the task of preparing the nation for war. The 1941 high of more than 76 billion kilowatt-hours sold to large light and power customers, 28 percent above 1940, largely represents the forging of arms and armor.

Of the 140,000,000 kw-hr. sold to all customers, an increase of 18.3 percent over 1940, more than one-half went to industry and next year and following years the ratio will undoubtedly go higher because curtailment of non-essential uses of electricity will inevitably result from the stringency of war. With this and with restrictions on production of



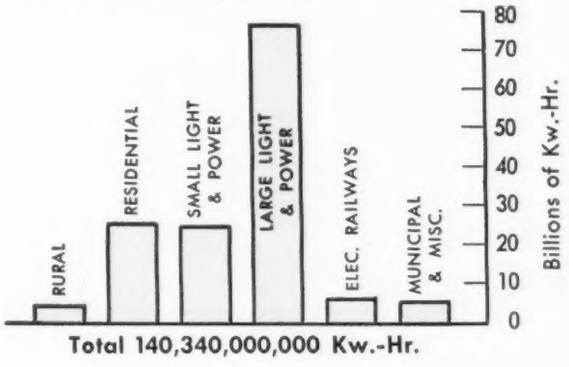
ENERGY SALES TO ULTIMATE CONSUMERS

(In Millions of Kw.-Hr.)

Year	Rural	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Street and Interurban Electric Railways	Electrified Divisions of Steam Railroads	Municipal and Miscellaneous	Total to Ultimate Consumers
1928..	1,387	8,420	11,692	37,715	1,911	4,991	560	312	66,988
1929..	1,602	9,526	13,106	42,971	2,038	5,049	590	412	75,294
1930..	1,789	10,703	13,944	40,148	2,227	4,996	591	508	74,906
1931..	1,879	11,373	13,544	36,937	2,330	4,549	626	664	71,902
1932..	1,579	11,494	12,106	30,965	2,033	4,040	568	926	63,711
1933..	1,633	11,358	11,589	33,857	1,893	3,991	668	927	65,916
1934..	1,858	12,233	12,278	36,943	1,896	4,237	692	945	71,082
1935..	1,693	13,496	13,588	40,864	2,078	4,194	841	842	77,596
1936..	2,138	14,992	15,612	48,655	2,223	4,401	1,115	908	90,044
1937†.	1,670	17,691	18,075	51,360	1,863	4,428	1,284	2,987	99,359
1938†.	1,577	19,371	19,137	43,140	1,929	3,989	1,449	3,138	93,731
1939†.	1,881	21,084	20,722	51,108	2,002	3,918	1,847	3,205	105,768
1940†.	1,991	23,318	22,373	59,557	2,048	3,974	1,935	3,447	118,643
1941*†	2,350	25,138	24,730	76,247	2,109	3,975	2,119	3,672	140,340

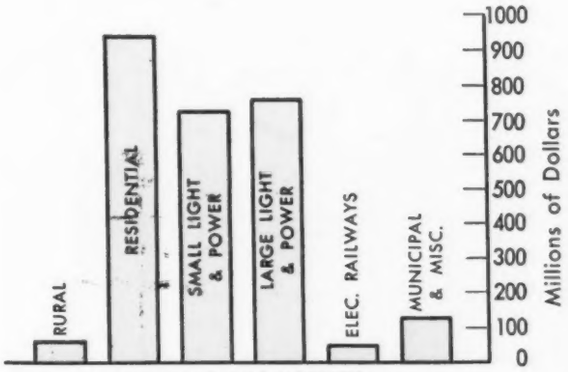
Source: Edison Electric Institute. *Estimated. †Revised figures to conform with Uniform System of Accounts prescribed by Federal Power Commission.

ENERGY SALES BY CLASSES OF CONSUMERS, 1941



Total 140,340,000,000 Kw.-Hr.

REVENUE BY CLASSES OF CONSUMERS, 1941



Total $2,670,450,000

electrical appliances it is not likely that the 1941-1942 increases of 7.8 percent in residential energy sales, of 10 percent in small light and power (commercial customer) sales and of 7 to 18 percent in other classes of sales will be repeated in 1943 over 1942. As a matter of fact, the rate of increase in residential electricity sales is already lessening. It was 10.6 percent in 1941 over 1940 and has dropped nearly 3 percent in the past year.

Through the past ten years or more the outstanding phenomenon of electricity sales has been the steady growth of usage by residential customers. Industrial power sales went up and went down as the pulse of business quickened and slowed. But residential consumers continued without break to increase their uses of electricity. That condition now is about to become history. If they do not actually decline in the next few years, residential sales will at least slow up in rate of growth, perhaps rest on a plateau until the end of the war allows this country again to assume its leadership of the world in progress to higher levels of living.

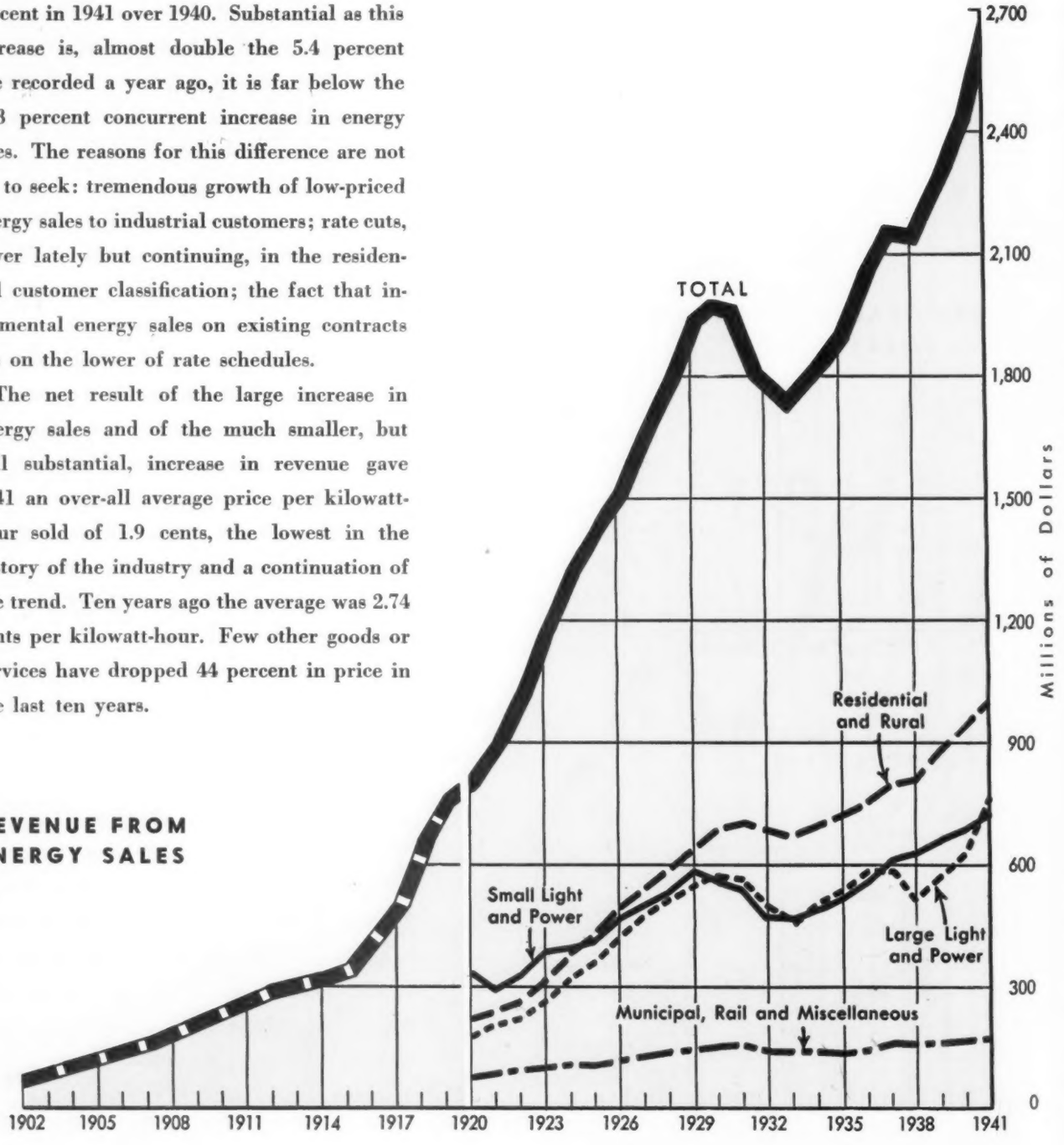
$2,670,450,000

REVENUE

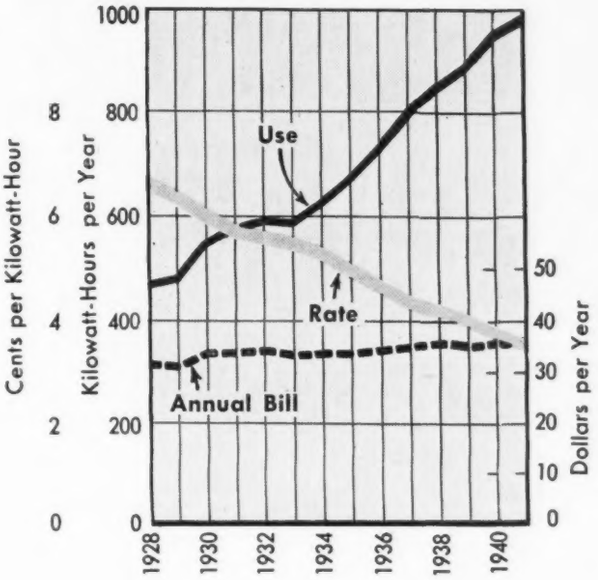
REVENUE FROM ELECTRICITY SALES WAS up 9.44 percent in 1941 over 1940. Substantial as this increase is, almost double the 5.4 percent rise recorded a year ago, it is far below the 18.3 percent concurrent increase in energy sales. The reasons for this difference are not far to seek: tremendous growth of low-priced energy sales to industrial customers; rate cuts, fewer lately but continuing, in the residential customer classification; the fact that incremental energy sales on existing contracts are on the lower of rate schedules.

The net result of the large increase in energy sales and of the much smaller, but still substantial, increase in revenue gave 1941 an over-all average price per kilowatt-hour sold of 1.9 cents, the lowest in the history of the industry and a continuation of the trend. Ten years ago the average was 2.74 cents per kilowatt-hour. Few other goods or services have dropped 44 percent in price in the last ten years.

REVENUE FROM ENERGY SALES



AVERAGES FOR RESIDENTIAL SERVICE



Revenue from residential customers, totaling about $940,000,000, continues as the largest single source of electric utility income. Next, and for the first time since 1937 in second place, comes large light and power revenue. Analyzing residential revenues and sales further, the averages per customer of annual bill and energy usage reached new high levels of $36.68 and 986 kw-hr., resulting in an average rate of 3.73 cents per kilowatt-hour, the trend continuing down.

To be noted also in revenue, as in energy sales, is the conspicuous slowing up in rate of growth in the residential customer classification. The addition of 34 kw.-hr. to average annual usage is the smallest in seven years. And the addition of 12 cents to the annual average bill is the smallest since actual decrease was recorded in 1933.

RESIDENTIAL SERVICE to Urban and Non-Farm Homes

Year	Kw.-Hr. per Customer	Average Annual Bill (Dollars)	Revenue per Kw.-Hr. (Cents)
1926	428	29.87	6.98
1929	499	31.44	6.30
1930	543	32.58	6.00
1931	578	33.18	5.74
1932	597	33.25	5.57
1934	624	33.07	5.30
1935	672	33.53	4.99
1936	727	33.81	4.65
1937	805	34.62	4.30
1938	853	35.31	4.14
1939	897	35.88	4.00
1940	952	36.56	3.84
1941*	986	36.68	3.73

Source: Edison Electric Institute. *Estimated

REVENUE FROM ELECTRICITY SALES

(In Thousands of Dollars)

Year	Rural	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Street and Interurban Electric Railways	Electrified Divisions of Steam Railroads	Municipal and Miscellaneous	Total from Ultimate Consumers
1928.....	36,540	555,894	519,957	529,173	83,024	46,488	5,559	7,670	1,743,809
1929.....	40,665	600,265	555,640	591,038	88,323	46,277	5,986	10,322	1,938,520
1930.....	46,689	642,275	575,598	566,467	95,458	46,067	6,015	12,382	1,990,955
1931.....	50,726	653,282	564,523	544,728	99,298	41,912	6,725	14,746	1,975,944
1932.....	47,127	640,384	500,993	474,424	89,828	36,701	6,181	18,076	1,813,717
1933.....	46,501	623,797	471,780	468,389	83,097	35,098	6,658	19,243	1,754,366
1934.....	49,182	648,801	490,420	499,451	81,846	36,402	6,680	19,085	1,831,870
1935.....	48,404	673,526	519,213	531,106	79,429	36,431	7,944	15,933	1,911,988
1936.....	59,286	696,997	562,122	581,148	80,791	37,423	9,591	17,225	2,044,586
1937†.....	37,726	759,824	616,438	583,197	72,740	37,019	10,761	43,091	2,160,798
1938†.....	38,928	802,532	632,091	518,694	74,323	33,512	11,995	44,504	2,156,580
1939†.....	45,484	843,158	660,683	572,659	75,443	32,573	14,427	45,154	2,289,583
1940†.....	49,473	895,951	689,253	631,428	76,052	32,740	15,068	50,252	2,440,218
1941*†....	63,510	939,058	727,363	761,300	77,075	32,502	16,512	53,130	2,670,450

Source: Edison Electric Institute. *Estimated. †Revised figures to conform with Uniform System of Accounts prescribed by Federal Power Commission.

Largest Gain in 15 Years

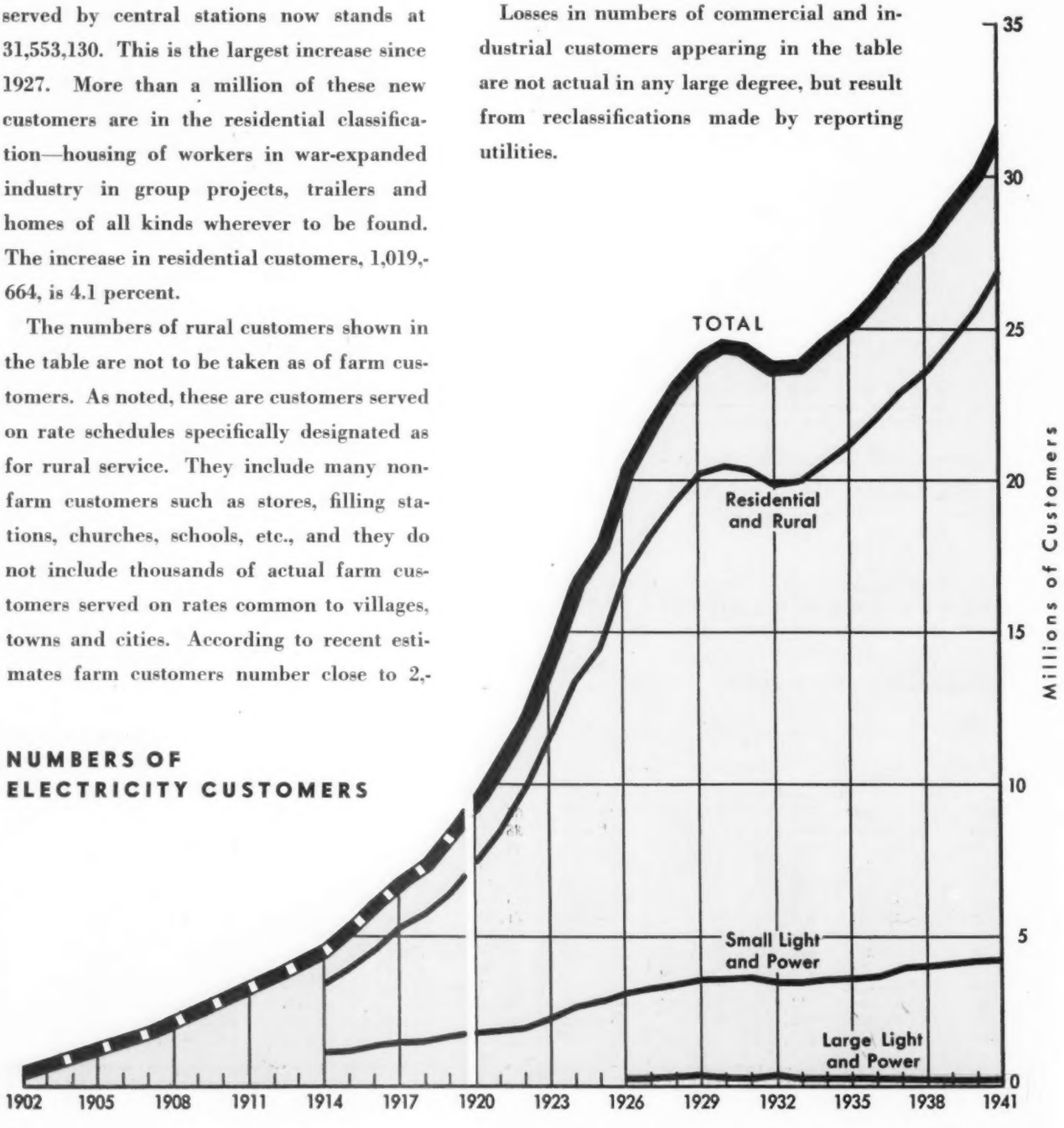
CUSTOMERS

WITH A GAIN of 1,362,129 in the past year, 4.5 percent, total number of customers served by central stations now stands at 31,553,130. This is the largest increase since 1927. More than a million of these new customers are in the residential classification—housing of workers in war-expanded industry in group projects, trailers and homes of all kinds wherever to be found. The increase in residential customers, 1,019,-664, is 4.1 percent.

The numbers of rural customers shown in the table are not to be taken as of farm customers. As noted, these are customers served on rate schedules specifically designated as for rural service. They include many non-farm customers such as stores, filling stations, churches, schools, etc., and they do not include thousands of actual farm customers served on rates common to villages, towns and cities. According to recent estimates farm customers number close to 2,-500,000, and of these about 900,000 are served by REA cooperative projects.

Losses in numbers of commercial and industrial customers appearing in the table are not actual in any large degree, but result from reclassifications made by reporting utilities.

NUMBERS OF ELECTRICITY CUSTOMERS



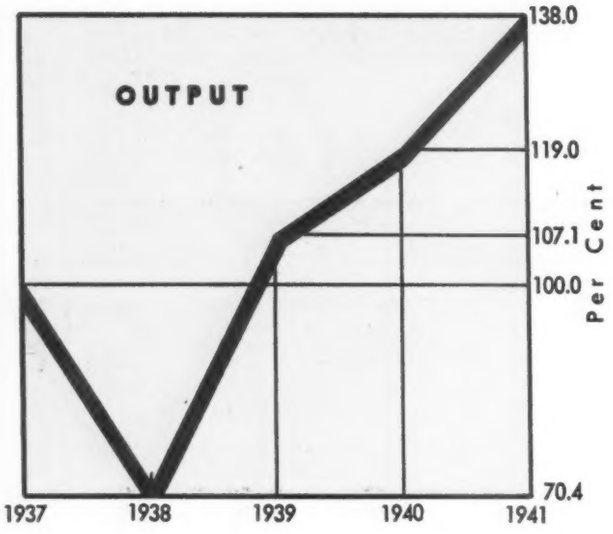
CENTRAL STATION CUSTOMERS AT END OF YEAR*

Region and State	Total Number			Rural (Distinct Rural Rates)			Residential			Commercial and Industrial			Municipal, Rail and Miscellaneous		
	1941	1940	Change in 1941	1941	1940	Change in 1941	1941	1940	Change in 1941	1941	1940	Change in 1941	1941	1940	Change in 1941
UNITED STATES	31,553,130	30,191,001	1,362,129	988,220	685,812	302,408	25,971,570	24,951,906	1,019,664	4,476,280	4,438,160	38,120	117,060	115,123	1,937
NEW ENGLAND	2,574,700	2,513,420	61,280	7,820	4,625	3,195	2,203,010	2,145,104	57,906	356,960	356,116	844	6,910	7,575	−665
Maine	230,800	222,973	7,827	2,410	860	1,550	190,010	185,019	4,991	35,800	34,579	1,221	2,580	2,515	65
New Hampshire	152,900	147,526	5,374	170	161	9	131,000	125,910	5,090	19,840	19,657	183	1,890	1,798	92
Vermont	95,800	92,406	3,394	3,320	1,806	1,514	77,000	74,986	2,014	14,550	14,762	−212	930	852	78
Massachusetts	1,341,800	1,322,261	19,539	1,020	1,013	7	1,150,000	1,129,306	20,694	189,590	189,945	−355	1,190	1,997	−807
Rhode Island	217,900	211,282	6,618	400	319	81	189,000	182,518	6,482	28,370	28,190	180	130	255	−125
Connecticut	535,500	516,972	18,528	500	466	34	466,000	447,365	18,635	68,810	68,983	−173	190	158	32
MIDDLE ATLANTIC	7,965,000	7,806,565	158,435	32,280	32,982	−702	6,750,000	6,584,280	165,720	1,158,970	1,163,829	−4,859	23,750	25,474	−1,724
New York	4,097,700	4,050,624	47,076	700	468	232	3,460,000	3,404,394	55,606	622,600	631,010	−8,410	14,400	14,752	−352
New Jersey	1,320,500	1,279,845	40,655	80	75	5	1,120,000	1,077,769	42,231	198,600	199,688	−1,088	1,820	2,313	−493
Pennsylvania	2,546,800	2,476,096	70,704	31,500	32,439	−939	2,170,000	2,102,117	67,883	337,770	333,131	4,639	7,530	8,409	−879
EAST NORTH CENTRAL	7,383,300	7,136,249	247,051	293,600	249,385	44,215	6,160,000	5,968,763	191,237	907,770	896,708	11,062	21,930	21,393	537
Ohio	1,966,900	1,896,123	70,777	78,400	71,348	7,052	1,650,000	1,588,081	91,919	228,930	227,333	1,597	9,570	9,361	209
Indiana	931,700	889,453	42,247	63,000	56,865	6,135	745,000	712,790	32,210	118,150	114,253	3,897	5,550	5,545	5
Illinois	2,160,300	2,108,421	51,879	66,000	42,149	23,851	1,820,000	1,796,624	23,376	271,850	267,185	4,665	2,450	2,463	−13
Michigan	1,498,200	1,451,191	47,009	14,500	11,444	3,056	1,305,000	1,261,476	43,524	176,480	176,443	37	2,220	1,828	392
Wisconsin	826,200	791,061	35,139	71,700	67,579	4,121	640,000	609,792	30,208	112,360	111,494	866	2,140	2,196	−56
WEST NORTH CENTRAL	2,997,040	2,874,235	122,805	110,780	98,135	12,645	2,406,000	2,291,275	114,725	469,400	474,067	−4,667	10,860	10,758	102
Minnesota	644,900	601,789	43,111	15,160	13,248	1,912	530,000	487,850	42,150	98,230	98,892	−662	1,510	1,799	−289
Iowa	605,600	581,707	23,893	36,400	32,915	3,485	470,000	451,908	18,092	97,140	94,900	2,240	2,060	1,984	76
Missouri	834,820	806,816	28,004	25,400	24,171	1,229	680,000	654,215	25,785	127,220	126,465	755	2,200	1,965	235
North Dakota	96,900	91,143	5,757	500	397	103	74,000	67,090	6,910	21,740	23,040	−1,300	660	616	44
South Dakota	99,920	102,954	−3,034	880	1,593	−713	77,000	77,432	−432	21,360	23,250	−1,890	680	679	1
Nebraska	298,800	291,737	7,063	9,840	9,608	232	245,000	236,110	8,890	42,800	44,869	−2,069	1,160	1,150	10
Kansas	416,100	398,089	18,011	22,600	16,203	6,397	330,000	316,670	13,330	60,910	62,651	−1,741	2,590	2,565	25
SOUTH ATLANTIC	3,023,440	2,755,347	268,093	97,140	80,588	16,552	2,481,160	2,250,801	230,359	433,580	413,062	20,518	11,560	10,896	664
Delaware	69,500	61,652	7,848	540	350	190	59,560	51,727	7,833	9,160	9,337	−177	240	238	2
Maryland-Dist. of Columbia	621,100	589,267	31,833	24,800	21,607	3,193	514,000	488,397	25,603	81,860	78,822	3,038	440	441	−1
Virginia	467,700	429,189	38,511	10,600	9,011	1,589	390,000	356,506	33,494	64,470	61,085	3,385	2,630	2,587	43
West Virginia	323,900	292,681	31,219	20,000	20,459	−459	262,600	233,707	28,893	39,430	36,683	2,747	1,870	1,832	38
North Carolina	509,740	447,023	62,717	24,500	20,655	3,845	412,000	356,373	55,627	71,640	68,443	3,197	1,600	1,552	48
South Carolina	211,300	185,225	26,075	8,100	6,249	1,851	170,000	147,572	22,428	32,720	31,050	1,670	480	354	126
Georgia	408,100	367,926	40,174	1,600	.....	1,600	343,000	307,640	35,360	62,700	59,549	3,151	800	737	63
Florida	412,100	382,384	29,716	7,000	2,257	4,743	330,000	308,879	21,121	71,600	68,093	3,507	3,500	3,155	345
EAST SOUTH CENTRAL	1,337,700	1,228,728	108,972	73,000	61,276	11,724	1,073,000	983,963	89,037	184,270	177,411	6,859	7,430	6,078	1,352
Kentucky	400,500	377,152	23,348	16,000	12,960	3,040	326,000	306,852	19,148	55,260	54,091	1,169	3,240	3,249	−9
Tennessee	422,700	385,176	37,524	8,700	7,091	1,609	355,000	323,258	31,742	57,130	54,122	3,008	1,870	705	1,165
Alabama	329,900	296,258	33,642	38,300	32,244	6,056	250,000	224,400	25,600	40,730	38,979	1,751	870	635	235
Mississippi	184,600	170,142	14,458	10,000	8,981	1,019	142,000	129,453	12,547	31,150	30,219	931	1,450	1,489	−39
WEST SOUTH CENTRAL	1,996,800	1,860,139	136,661	60,700	44,237	16,463	1,601,000	1,490,013	110,987	322,470	313,676	8,794	12,630	12,213	417
Arkansas	198,500	184,656	13,844	7,700	6,772	928	154,000	142,111	11,889	34,860	33,675	1,185	1,940	2,098	−158
Louisiana	334,600	314,545	20,055	2,500	461	2,039	280,000	263,817	16,183	50,730	49,091	1,639	1,370	1,176	194
Oklahoma	366,000	351,270	14,730	13,500	12,739	761	287,000	273,227	13,773	63,310	62,932	378	2,190	2,372	−182
Texas	1,097,700	1,009,668	88,032	37,000	24,265	12,735	880,000	810,858	69,142	173,570	167,978	5,592	7,130	6,567	563
MOUNTAIN	921,750	868,158	53,592	19,900	14,942	4,958	757,400	715,482	41,918	138,940	132,713	6,227	5,510	5,021	489
Montana	123,100	123,134	−34	0	2	−2	104,000	104,072	−72	17,690	17,656	34	1,410	1,404	6
Idaho	137,350	126,409	10,941	4,900	4,137	763	111,000	103,061	7,939	19,970	17,754	2,216	1,480	1,457	23
Wyoming	50,600	48,396	2,204	400	359	41	42,000	40,143	1,857	8,090	7,791	299	110	103	7
Colorado	268,200	258,737	9,463	12,500	8,422	4,078	209,000	204,060	4,940	45,800	45,668	132	900	587	313
New Mexico	63,300	49,498	13,802	0	4	−4	51,300	39,383	11,917	11,750	9,904	1,846	250	207	43
Arizona	107,900	103,188	4,712	1,400	1,431	−31	90,000	85,301	4,699	16,180	16,138	42	320	318	2
Utah	140,900	132,178	8,722	700	587	113	125,000	117,586	7,414	14,210	13,105	1,105	990	900	90
Nevada	30,400	26,618	3,782	.....	.....	.....	25,100	21,876	3,224	5,250	4,697	553	50	45	5
PACIFIC	3,353,400	3,148,160	205,240	293,000	99,642	193,358	2,540,000	2,522,225	17,775	503,920	510,578	−6,658	16,480	15,715	765
Washington	570,700	536,832	33,868	23,000	19,828	3,172	470,000	442,786	27,214	75,000	71,769	3,231	2,700	2,449	251
Oregon	329,700	315,931	13,769	10,000	8,701	1,299	270,000	259,318	10,682	48,220	46,254	1,966	1,480	1,658	−178
California	2,453,000	2,295,397	157,603	260,000	71,113	188,887	1,800,000	1,820,121	−20,121	380,700	392,555	−11,855	12,300	11,608	692

Source: Edison Electric Institute. *1941 estimated. Indicated losses in commercial and industrial grouping are in general due to reclassifications.

War Economy Effects on

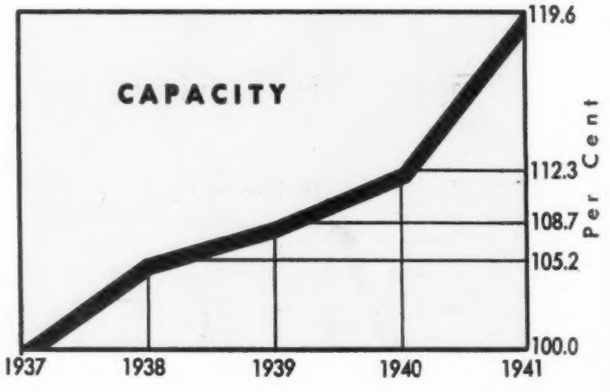
UTILITY ECONOMY

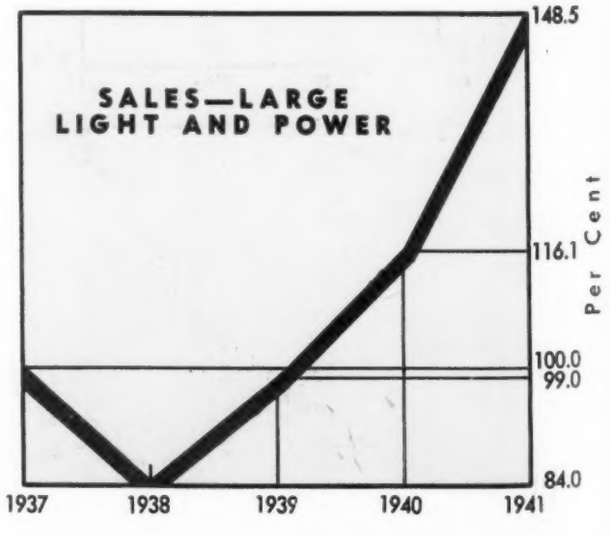


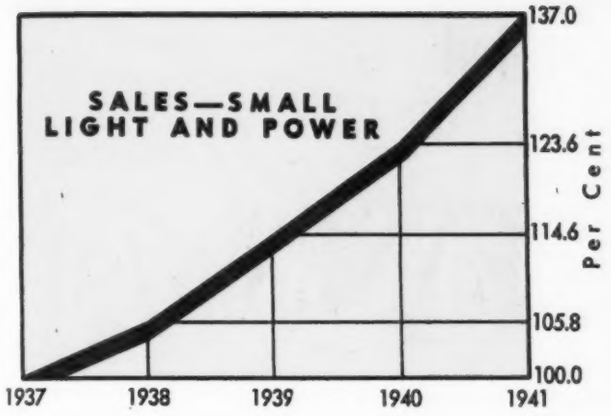
WHEN WAR OVERTOOK this nation last December, it merely stepped out of its shadow, which had been deepening over the United States since 1939. Thus this country's change to a war economy was not so abrupt as the actual shock of war's beginning made it appear. Ways and trends were already set in their new directions.

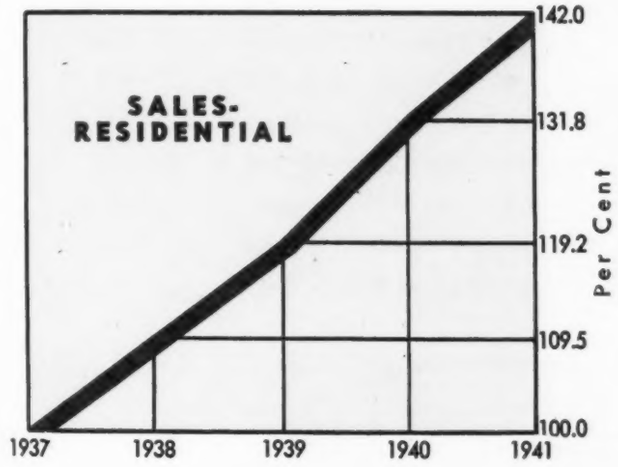
Evidence of the change is not lacking. It appears on these two pages in reference to the electric utility industry. The curves show percentage changes from 1937, which year was taken as the base because it was a peace year of high business level. As regards the changes caused by war and by the period of its impending, only the 1940 and 1941 points on the curves are significant.

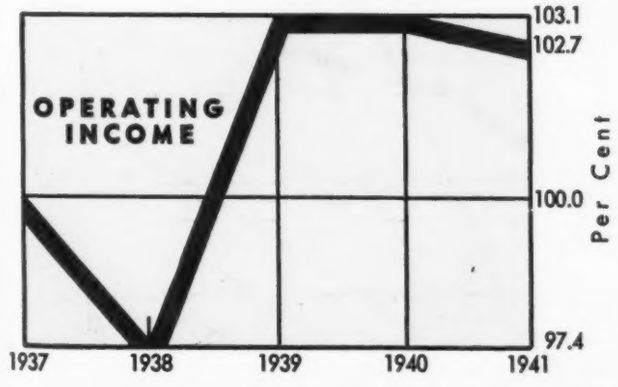
Some of the rise in output in 1940, perhaps much of it, was continuation of recovery from the low of 1938. But only war, with its heavy demands on industrial production shown in the curve of energy sales to large light and power customers, explains the steepened slope of the curve between the points of 1940 and 1941.

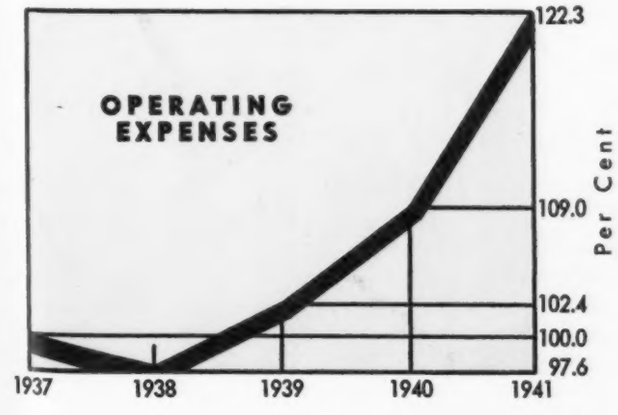








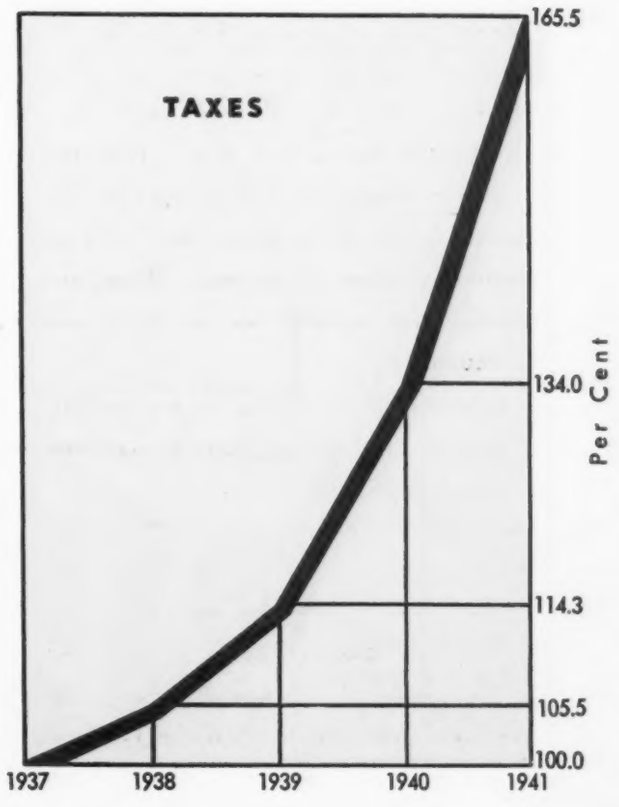




Because electricity production capacity increase is by its nature only sluggishly responsive to business level changes, the curve of capacity shows the effect of war less spectacularly than do those of output and of large light and power sales.

The curve of residential sales is especially significant. The change is hardly more than perceptible, but from 1940 to 1941 the curve droops a little in its upward climb. As the effects of priorities and allocations are more strongly felt in 1942, this curve will flatten more.

No cause for rejoicing can be found in the curves of operating expenses, of operating income and of taxes. Expenses and taxes rise and operating income, after a recovery from 1938, holds level in 1939 and 1940 and turns down in 1941. War increases costs. War increases taxes. All of the skill and resource of utility management will be needed to keep the curve of operating income from going down disastrously fast in the coming years.



Operating Costs Well Controlled

EXPENSES

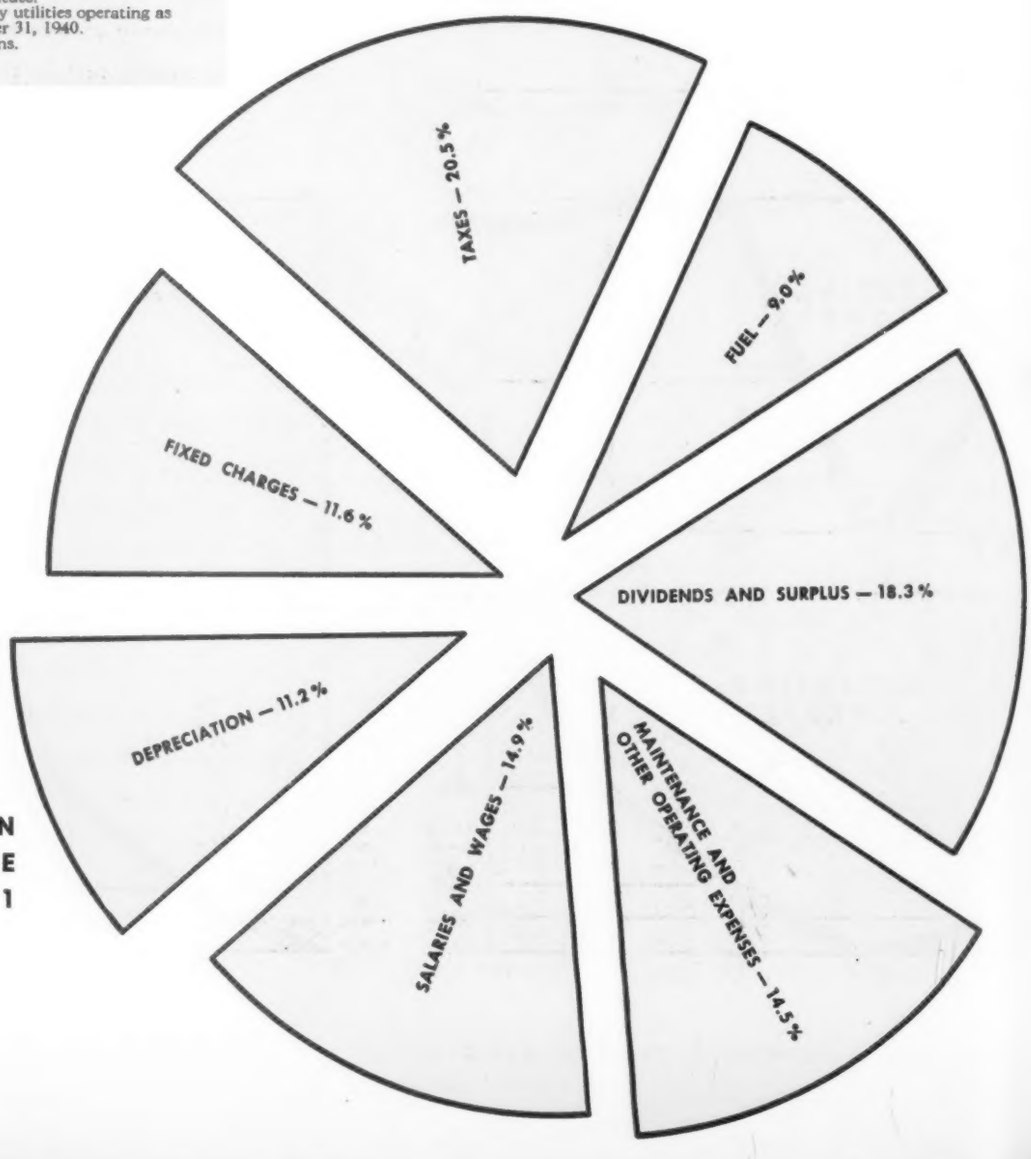
OPERATING REVENUE, EXPENDITURES, TAXES

Privately Owned Establishments*
(In Millions of Dollars)

Year	Operating Revenue	Operating Expenditures	Taxes
1932.....	1,713	618	201
1933.....	1,640	600	212
1934.....	1,710	635	239
1935.....	1,785	669	251
1936.....	1,911	721	281
1937.....	2,031	781	308
1938.....	2,018	762	323
1939.....	2,148	798	352
1940.....	2,277	851	413
1941†.....	2,491	955	510

Source: Edison Electric Institute.
* Data adjusted to cover only utilities operating as private enterprises on December 31, 1940.
† Subject to year-end revisions.

FROM THE END of 1932 to the start of 1942, nine years, annual operating revenues of privately owned electric utilities increased 44.5 percent, operating expenditures rose 54.5 percent and taxes went up 153 percent. Taxes climbed more than three times as fast as revenue. The largest increases between consecutive years occurred from 1940 to 1941


TAXES — 20.5%
FUEL — 9.0%
FIXED CHARGES — 11.6%
DIVIDENDS AND SURPLUS — 18.3%
DEPRECIATION — 11.2%
SALARIES AND WAGES — 14.9%
MAINTENANCE AND OTHER OPERATING EXPENSES — 14.5%

ALLOCATION OF REVENUE DOLLAR, 1941

OPERATING RATIO BEFORE AND AFTER TAXES

Privately Owned Establishments

	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Before Taxes...	35.7	36.0	36.6	36.9	37.3	38.5	37.3	37.4	37.5	38.4
After Taxes...	47.8	48.8	50.6	50.9	52.2	53.8	54.2	53.3	55.3	58.9

in all three items. This is the obvious effect of the national effort that began in 1940 as defense and changed last December to war.

The rise in operating expense of 12.2 percent in 1941, as against the lesser coincident rise of 9.5 percent in operating revenue, reflects a number of contributing conditions — among them higher costs of labor, fuel and supplies, and the operation of low efficiency capacity because of drought—all accentuated by a rapid rise in energy output. Significant in the increase of operating cost is the rise in payroll, indicating a higher level of employee compensation.

The tabular data and the graph of operating ratios before and after taxes show that in the matters of expense within their control utility men are doing a pretty good job. Despite increases in payroll and an otherwise generally rising level of costs, operating ratio before taxes climbs but slowly, in 1941 only 0.9 percent higher than in 1940.

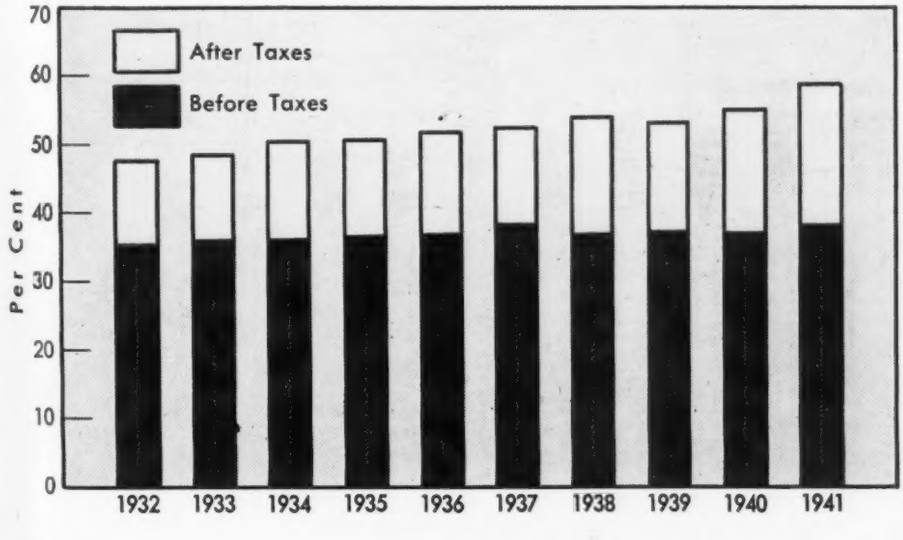
EMPLOYEES, PAYROLLS, FUEL, MAINTENANCE

Private and Municipal Establishments

Year	Number of Employees	Thousands of Dollars		
		Payroll	Fuel Cost	Maintenance
1937..	279,000	470,353	173,000	131,000
1938..	270,000	460,000	156,000	132,000
1939..	269,000	469,500	188,000	137,000
1940..	265,000	488,000	215,000	145,000
1941..	270,000	537,000	249,000	155,000

Estimated by Electrical World on U. S. Census and E.E.I. data.

OPERATING RATIO BEFORE AND AFTER TAXES



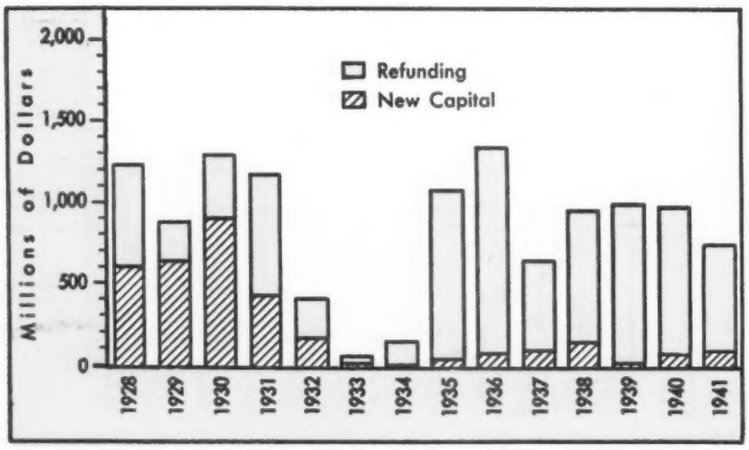
Refundings Decline

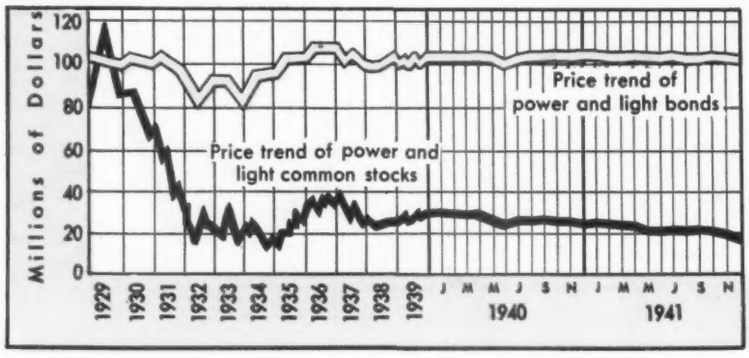
FINANCIAL

IT IS PLAINLY EVIDENT that the tremendous expansion of electric utility systems in 1941 was not financed by new capital in any considerable proportion. Securities representing new capital in the business amounted to less than one-sixth of the amount expended for new plants, lines and other facilities. New capital in 1941 was little more than what it was in 1940. This means that the companies continue to plow earnings back into plant, to use depreciation accumulations in the business and to make bank loans. These conditions apparently should improve the market for electric utility stocks.

But the market for utility stocks did not climb in 1941. It declined. The year closed with the industry's

DISTRIBUTION OF SECURITY SALES





PRICE TRENDS OF SECURITIES

NEW UTILITY FINANCING TOTALS $740,831,825

No. of Issues	Range of Yield	Amount of Issues
Mortgage Bonds (Av. yield 3.12%)		
14	2.55–2.99	$293,865,000
9	3.00–3.08	73,870,000
7	3.17–3.30	120,838,000
7	3.35–3.45	26,721,000
10	3.50–4.06	52,445,000
7	.....	5,845,000
54		$573,584,000
Debentures (Av. yield 2.91%)		
3	2.25–3.75	$13,400,000
1	.....	2,750,000
4		$16,150,000
Notes (Av. yield 2.37%)		
3	0.80–3.25	$23,050,000
4	.....	11,840,000
7		$34,890,000
Preferred Stock (Av. yield 4.56%)		
4	4.13–4.58	$56,792,600
7	4.76–5.05	45,286,200
1	.....	10,800,000
12		$112,878,800
Common Stock		
2		$3,329,025
Total Financing		$740,831,825
Refunding		643,766,800
New Capital		97,065,025

SECURITY SALES BY CLASSES

(In Thousands of Dollars)

Year	Bonds, Debentures, etc., to		Stocks, Common and Pfd.†	Total Financing†	Distribution of Security Sales*		
	Public Investors	Institutional Investors			New Capital	Refunding	Total Issues
1928.....	922,098		719,399	1,641,498	599,809	637,412	1,237,220
1929.....	523,408		937,051	1,460,459	624,174	257,602	881,776
1930.....	1,114,636	Included	473,218	1,587,854	894,473	403,062	1,297,535
1931.....	1,090,584	in	417,658	1,508,242	424,163	758,741	1,182,904
1932.....	404,840	Col. 1	65,417	470,257	165,728	239,112	404,840
1933.....	53,725		2,523	56,248	6,813	46,913	53,725
1934.....	131,175		.....	131,175	2,431	128,744	131,175
1935.....	957,042	110,629	8,229	1,075,900	26,496	1,049,404	1,075,900
1936.....	1,122,800	156,881	52,259	1,331,940	59,727	1,272,213	1,331,940
1937.....	522,613	37,604	86,095	646,312	81,984	563,699	645,682
1938.....	750,549	192,762	20,694	964,005	123,056	840,949	964,005
1939.....	620,205	252,625	123,517	996,347	16,219	980,128	996,347
1940.....	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941.....	368,712	255,912	116,208	740,832	97,065	643,767	740,832

† Including rights and warrants. *Not including common stock rights and warrants.

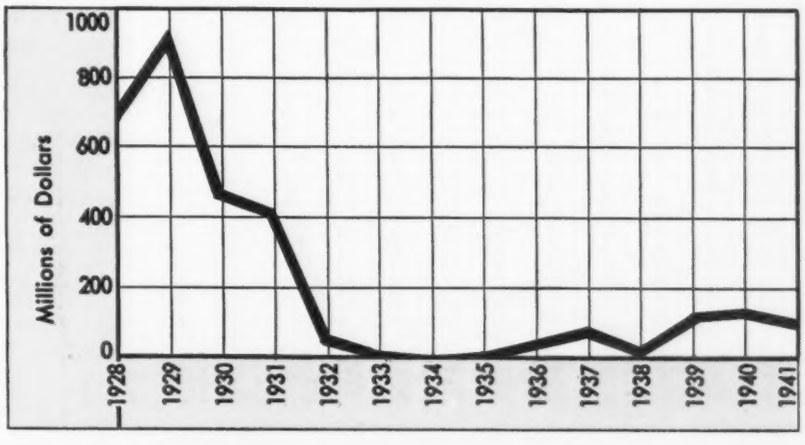
common stock index at 19.4, the lowest point since 1935. Characteristically, the bond market held up better, with an index range of 105 to 106.2. However, financing conditions during the year gave no indication of any major trend either in prices or in volume of new issues. An unexciting year.

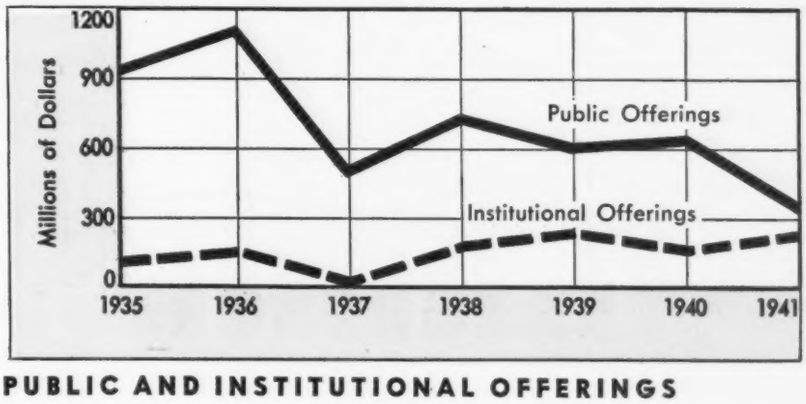
As has been the case in every year since 1931, refundings greatly overshadowed new capital offerings in 1941, the former amounting to $644,000,000, as against $97,000,000 for the latter, and at that refundings in 1941 were only 72 percent of their 1940 volume.

The increase in new capital in 1941, slight though it is, is noteworthy because, except for 1938, it is the highest in almost a decade. But that fact is no comfort to holders of utility equities, with the market stubbornly remaining low.

Public offerings of bonds and debentures hit a seven-year low in 1941 with a volume of $369,000,000 in eighteen issues, 56 percent of the total public offerings in 1940. Private or institutional offerings, at $256,000,000, however, went above the previous high point in 1939. Possibilities of savings by refunding seem to be passing as average bond yield rises, 3.12 in 1941, as against 3.04 percent in 1940.

TREND OF EQUITY FINANCING





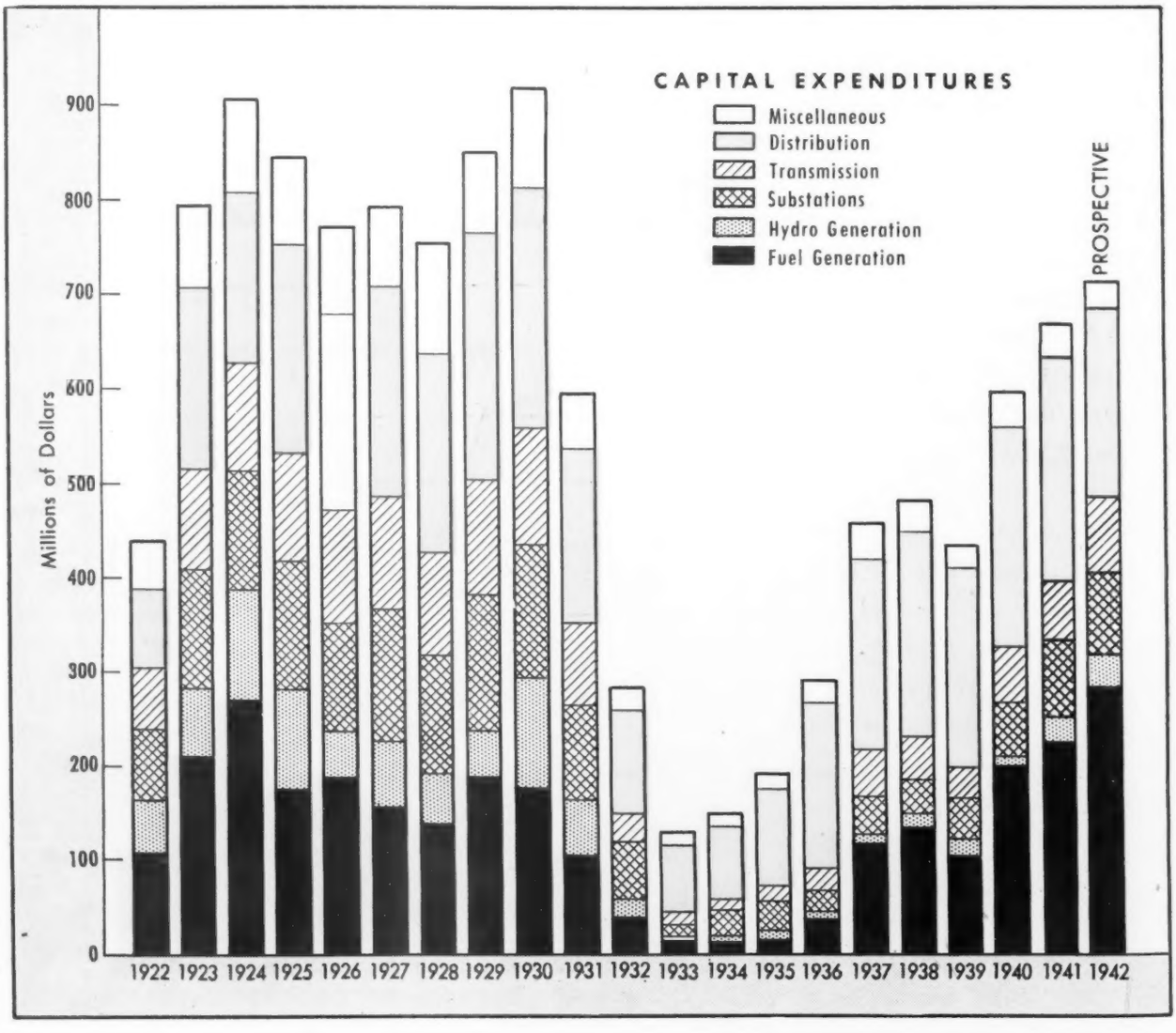
PUBLIC AND INSTITUTIONAL OFFERINGS

$700,719,000

BUDGET

PROPOSED CAPITAL EXPENDITURES of electric utilities in 1942 amount to $700,719,000, larger than any expenditure since and about 7 percent above the estimated total for 1941. With a third of a billion dollars for electrical construction by federal agencies contained in the national budget for the next fiscal year, total expenditures will climb close to a billion.

Of the total for electric utilities, excluding federal projects, nearly 45 per-



CAPITAL EXPENDITURES

Electric Light and Power Industry

1940 Expenditures	
Generating Stations	$209,700,000
Transmission, distribution, substations	351,360,000
Miscellaneous	35,520,000
Total	$596,580,000
1941 Expenditures	
Generating Stations	$246,927,000
Transmission, distribution, substations	374,804,000
Miscellaneous	32,687,000
Total	$654,148,000
1942 Expenditures (prospective)	
Generating Stations	$312,528,000
Transmission, distribution, substations	361,271,000
Miscellaneous	26,920,000
Total	$700,719,000

CAPITAL EXPENDITURES, 1941

As Reported to ELECTRICAL WORLD (In Thousands of Dollars)

Region	Fuel	Hydro	Transmission	Substations	Distribution	Miscellaneous	Total
East	57,345	1,320	13,815	16,073	62,075	7,188	157,816
Central	89,280	524	16,395	22,932	64,363	11,379	204,873
South	35,427	16,331	15,542	18,339	46,147	6,975	138,761
West	13,518	6,021	9,852	13,160	34,642	3,549	80,742
Total	195,570	24,196	55,604	70,504	207,227	29,091	582,192

PROSPECTIVE CAPITAL EXPENDITURES, 1942

East	64,430	1,006	20,022	22,789	48,401	5,966	162,614
Central	105,416	1,451	24,473	26,280	58,901	9,747	226,268
South	53,717	6,683	15,866	15,963	36,290	4,953	133,472
West	22,941	22,505	9,558	12,514	30,475	3,293	101,286
Total	246,504	31,645	69,919	77,546	174,067	23,959	623,640

cent is for generating stations, mostly fuel power. Slightly less than a quarter is slated for transmission and substations, and distribution accounts for 28 percent.

Priority limitations and now war are the major reasons for the decline in proposed distribution expenditures as they are also the reasons for the rise in the amount for generating stations.

The figures in the regional table are actual amounts reported to ELECTRICAL WORLD. They are slightly less than the amounts in the total table because the latter were adjusted to represent the whole industry, exclusive of federal projects. It is emphasized that the 1942 figures are prospective. No one can say what priorities, allocations and other conditions of war will do to them.

ANNUAL CAPITAL EXPENDITURES FOR NEW CONSTRUCTION

Electric Light and Power Industry (In Thousands of Dollars)

Year	Fuel	Hydro	Transmission	Substations	Distribution	Miscellaneous	Total
1924	269,700	109,540	134,190	114,000	179,010	101,000	907,440
1927	156,000	69,000	141,000	119,000	220,000	89,000	794,000
1928	137,000	56,000	125,000	107,000	212,000	117,000	754,000
1929	188,000	51,000	145,000	120,000	261,000	88,000	853,000
1930	176,496	117,565	139,533	123,482	258,699	103,642	919,417
1931	104,386	60,317	101,031	87,564	182,158	61,284	596,740
1932	40,000	20,000	60,000	30,000	110,000	25,000	285,000
1933	10,400	4,000	16,100	14,900	72,200	11,700	129,300
1934	10,258	5,704	30,180	11,921	76,299	13,292	147,654
1935	16,172	6,337	35,349	14,766	103,104	17,127	192,855
1936	36,820	9,030	20,170	25,050	174,640	24,000	289,710
1937	113,060	10,540	40,740	49,290	203,250	38,600	455,480
1938	133,000	17,600	36,000	46,400	215,000	34,000	482,000
1939	101,500	17,900	45,500	31,750	210,500	22,850	430,000
1940	200,430	9,270	55,900	57,760	237,700	35,520	596,580
1941	219,741	27,186	62,476	79,218	232,840	32,687	654,148
1942*	276,971	35,557	78,560	87,130	195,581	26,920	700,719

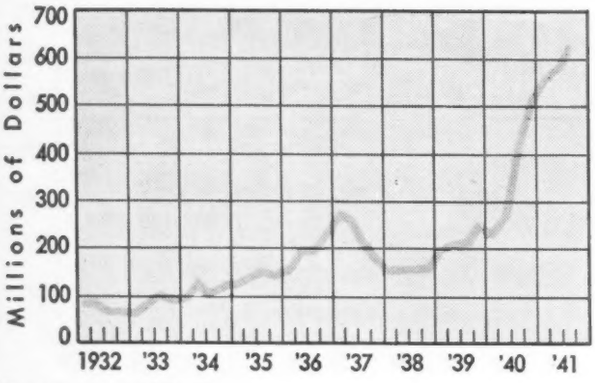
* Prospective.

$4 Billion Production in Record Year

MANUFACTURING

ELECTRICAL GOODS

New Orders Booked Quarterly by 78 Manufacturers

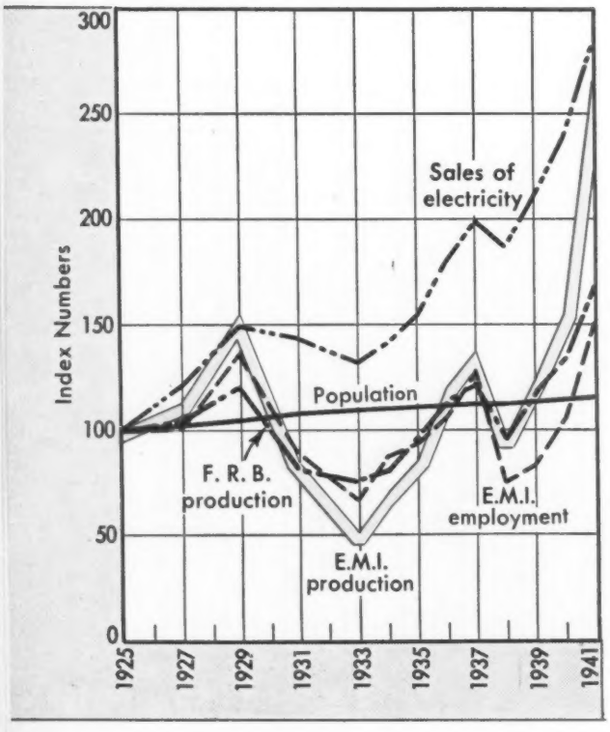


Data: Department of Commerce.

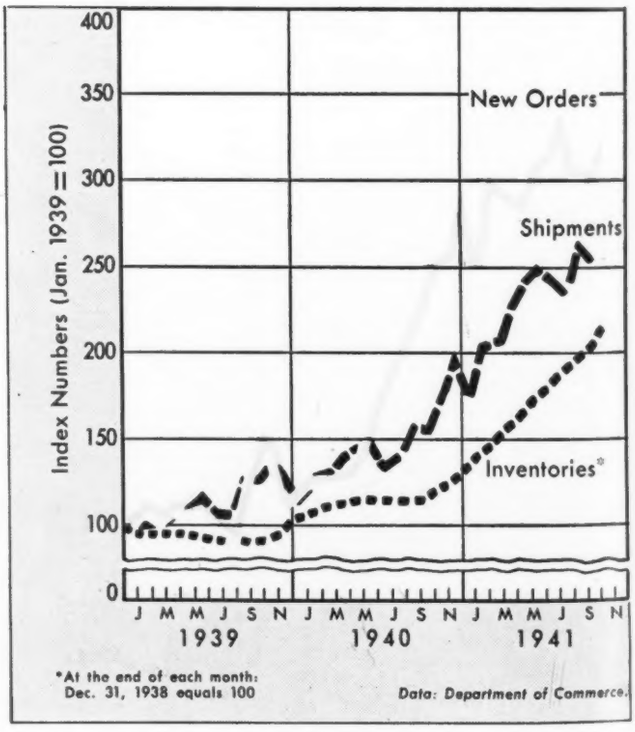
WITH WAR as the spur to raise it 71 percent from 1940, the $4 billion production of electrical manufacturers in 1941 tops 1929, the previous record year. This production includes turbines and all other electricity generation, transmission, distribution and utilization equipment, including appliances of all kinds. In comparison with the 71 percent rise in electrical goods output, general industrial production, F.R.B. index, was up only 24 percent.

Peak increases, highest yet, were made in all lines of electrical manufacturing production; refrigerators, 56 percent; other appliances, 40 percent; electrical materials, 79 percent; industrial apparatus, 89 percent; transmission and distribution equipment, 59 percent; insulated wire and cable, 89 percent.

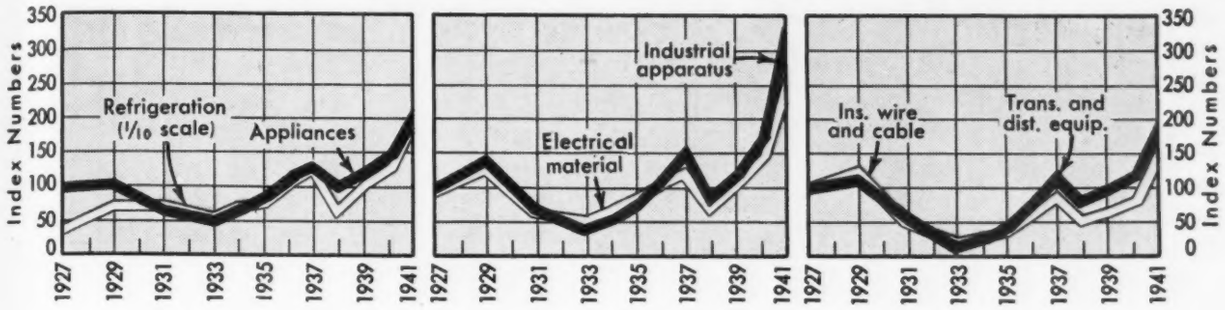
ELECTRICAL MACHINERY



ELECTRICAL MANUFACTURING AND RELATED FACTORS



MANUFACTURERS' SALES—Index: 1925=100



From June on, and after a rapid rise early in the year, new orders remained on a plateau about three times higher than the low level of 1938. Shipments are catching up, only 20 percent behind in October, 1941, as against 37 percent twelve months before. Supply of raw materials and parts is improving, as indicated by increases of 77 percent in inventories and 60 percent in shipments in the year past. Employment rose 42 percent from 1940.

ELECTRICAL MANUFACTURING INDUSTRY AND RELATED FACTORS

Index Numbers 1925=100

	1929	1931	1933	1934	1935	1936	1937	1938	1939	1940	1941*
1. E. M. I. production	156	85	51	70	85	119	137	97	123	154	264
2. E. M. I. employment	137	90	68	88	94	106	128	77	84	106	151
3. F. R. B. production	121	82	76	82	96	113	124	97	119	135	168
4. Sales of electricity	150	144	131	141	155	180	199	187	212	238	281
5. Population	106	108	109	110	111	112	113	113	114	115	116
6. Electrical goods orders	152	83	46	63	77	109	133	90	124	205	393

Source: N.E.M.A. *Estimated.

1. E.M.I. PRODUCTION based on U. S. Census of Manufactures and data compiled by N.E.M.A. statistical department. In addition to products shown in electrical machinery apparatus and supplies schedule of the Census there are included electric refrigeration, radio apparatus and supplies, steam turbines for electrical drive, electrical porcelain, glass insulators and electric washing machines.

2. E.M.I. EMPLOYMENT based on labor series of National Industrial Conference Board, but adjusted to 1925=100. This series represents the electrical manufacturing industry including radio.

3. F.R.B. PRODUCTION based on the Federal Reserve Board's revised index for the manufacturing industry and adjusted to 1925=100. (Entire series revised in 1940.)

4. ELECTRIC POWER SALES index figures based upon Edison Electric Institute data.

5. POPULATION based upon the annual midyear estimates of the U. S. Bureau of the Census.

6. NEW ORDERS booked — electrical goods — based on the quarterly reports of the U. S. Bureau of the Census.

SOME MAJOR BRANCHES OF THE ELECTRICAL MANUFACTURING INDUSTRY

Index Numbers 1925=100

	Manufacturers' Sales	1929	1931	1933	1934	1935	1936	1937	1938	1939	1940	1941*
1. Appliances	100 = $140,000,000	110	72	57	73	92	121	136	109	128	151	211
2. Refrigeration	100 = 16,000,000	766	778	574	747	844	1,131	1,360	769	1,100	1,331	2,071
3. Electrical material	100 = 38,000,000	135	71	59	74	93	116	131	83	116	149	266
4. Industrial apparatus	100 = 132,000,000	149	75	47	59	83	118	161	97	127	177	335
5. Trans. and dist. equip.	100 = 167,000,000	120	64	22	33	50	83	124	90	104	124	197
6. Ins. wire and cable	100 = 110,000,000	133	54	27	36	46	69	98	60	71	87	164

Source: N.E.M.A. *Estimated.

1. APPLIANCES include domestic kitchen and table appliances, electric ranges, electric water heaters, electric vacuum cleaners, electric washing machines, electric fans and food service equipment.

2. HOUSEHOLD REFRIGERATION includes complete units, parts and cabinets. Commercial refrigeration equipment and air-conditioning equipment are excluded. These index figures appear unusually large because the household refrigeration industry was just beginning about 1925 and therefore the base figure is small.

3. ELECTRICAL MATERIAL includes carbon, electrical porcelain, laminated phenolic products, manufactured electrical mica and vulcanized fiber. Molded insulation is excluded.

4. INDUSTRIAL APPARATUS includes electric welding equipment and wire, industrial controls, industrial heating equipment and motors and generators (excluding all generators except motor-generator sets.) Electric furnaces and electric tools are excluded.

5. TRANSMISSION AND DISTRIBUTION EQUIPMENT includes switchgear, high-voltage insulators, power and distribution transformers, lightning arresters, pole line hardware and earth anchors, panelboards and distribution boards, small air circuit breakers and electrical measuring instruments.

6. INSULATED WIRE AND CABLE for light and power includes wire and cable of various types of insulation such as paper, rubber, varnished cambric and weatherproof used primarily for lighting and power circuits and lines. Bare wire is excluded.

All indices based upon U. S. Census of Manufactures data and N.E.M.A. statistical department data corrected where possible to represent the entire industry.

Approaching Half a Billion Dollars

REA

OPERATING RATIO of 49 percent, exclusive of taxes, insurance and other small costs; average energy sale per customer of 835 kw-hr; cost of purchased energy 9.9 mills per kilowatt-hour; average of 4.7 cents per kilowatt-hour paid by consumers; energy loss 25 percent; these are some of the indicatory figures to be derived from the data of REA operations on this page.

But the values of these figures as indicators of conditions either favorable or unfavorable to REA are not to be accepted without question. In the first place, they are derived from data in the third column of the table, data estimated from records of ten months or less. Secondly, statistical reports from cooperatives still leave much to be desired in clarity and definition and compilation of total statistics is thus a matter of mixing judgment with addition. And, thirdly, the high proportion of "green" projects, not yet stabilized in operation, prevents conslusions validly comparable to seasoned operations.

It was attempted to set up the table on this page in quantities that in time would be comparative with statistics of the established electric utility industry. But because of accounting differences this attempt was not wholly successful. However, as the years pass and the table is continued the data will acquire inherent comparative values on which judgment of REA operations may be based.

STATISTICS OF REA-FINANCED SYSTEMS

Item	Fiscal Year Ended June 30, 1940	Fiscal Year Ended June 30, 1941	Calendar Year 1941 †
Cumulative Year-End Data			
Total Funds Allotted	$268,972,949	$369,027,621	$431,750,000
Distribution Lines	$256,705,238	$349,234,288	$392,900,000
Generation and Transmission	$6,677,000	$12,289,150	$28,000,000
Consumer Facilities	$5,590,711	$7,504,183	$10,850,000
Funds Advanced	$221,287,287	$296,395,142	$330,000,000
Systems in Operation	630	732	760
Miles of Line in Operation	232,978	307,590	350,000
Consumers Connected	549,604	780,482	900,000
Generating Plants—Number	21	38	47
Generating Plants—Kw. Capacity	18,827	32,843	52,000
Annual Data			
Energy Generated—Kw.-Hr.	34,314,000	55,911,000	83,600,000
Energy Purchased—Kw.-Hr.	401,823,000	684,504,000	857,500,000
Total System Input	436,137,000	740,415,000	941,100,000
Energy Sold—Kw.-Hr.	311,479,000	568,188,000	752,800,000
Gross Revenues	$17,376,016	$29,356,462	$35,225,000
Purchased Energy	$4,661,146	$7,330,201	$8,500,000
Salaries and Wages	*	$4,696,011	$5,400,000
General Expenses	*	$2,634,581	$3,025,000
Insurance, Taxes and Misc.	*	$1,625,514	$1,825,000
Non-Operating Expenses	*	$296,912	$350,000
Total Expenses	*	$16,583,219	$19,100,000
Interest Due and Payable	*	$3,048,232	$4,500,000
Interest Accumulated Not Due	*	$1,828,326	$2,000,000
Net Income before Depreciation	*	$7,064,252	$9,625,000
Payments to government—Cumulative Data			
Interest Due	$2,346,393	$5,460,483	$8,080,000
Interest Paid	$2,318,211	$5,418,622	$8,020,000
Principal Due	$2,143,355	$5,402,177	$7,070,000
Principal Paid	$2,524,104	$8,521,006	$10,820,000
Overdue Amounts	$79,837	$124,898	$170,000
a. Interest	$28,182	$41,861	$60,000
b. Principal	$51,655	$83,037	$110,000
Advance Payment of Principal	$432,404	$3,201,866	$3,860,000

Source of Data: Statistical Reports Published by REA.
1. Monthly Statistical Bulletin No. 8, Oct. 30, 1941.
2. Allotment, Construction, Operating and Financial Statistics, REA-Financed Systems, June 30, 1941.

* Data not available.

† Ten months actual in most cases and two to six months estimated. Because of the rapid expansion and development of the REA-financed systems and the decreasing cost characteristics of the industry, expense items are difficult to estimate and relationships between income and plant data are not comparable with those of stabilized enterprises. Data on operating expenses for its 760 operating borrowers are not presently summarized monthly by the Rural Electrification Administration.

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Chronology of

1941

JANUARY

President Roosevelt's 17½-billion-dollar budget contains requests totaling $150,000,000 for New Deal power projects and distribution systems.

Consumers Public Power District buys northwestern Nebraska properties of Interstate Power Co. for $2,600,000.

Central Power Co. properties sold to Consumers Public Power District.

Public Service Corp. of New Jersey authorizes $28,000,000 budget for 1941.

Northern States Power Co. plans to spend $8,160,000 in 1941 for expansion and improvements.

Carolina Power & Light Co. starts work on new 40,000-hp. steam-electric plant in Raleigh area; cost $3,000,000.

Philadelphia Electric Co. plans to spend $50,000,000 in 1941.

Central Maine Power Co. starts construction of new tidewater steam station at Wiscasset; initial equipment, 25,000-hp. steam unit.

Public Service Electric & Gas Co., Newark, N. J., orders 50,000-kw. turbo-generator for Marion station.

Boston Edison Co. announces plans for construction of new tidewater steam-generator plant in Everett. Will house 40,000-kw. turbo-generator.

A.I.E.E. holds winter meeting in Philadelphia.

SEC issues "blueprint" for U.G.I. system.

Pacific Gas & Electric announces plans for Cresta and Pulga plants on Feather River.

FEBRUARY

Utilities to buy power of Elephant Butte Dam. Project undergoes final tests.

Florida Power & Light Co. will install new 30,000-kw. turbo-generator in Miami Beach plant.

Pacific Gas & Electric Co. announces $27,000,000 construction program for 1941, including new plants near Dutch Flat and at Cresta.

San Diego Gas & Electric Co. announces $1,468,000 budget; 35,000-kw. installation planned for new Silver Gate station.

Indianapolis Power & Light Co. adds units ahead of schedule; 37,500-kw. turbo-generator planned for Harding Street plant.

SEC Chairman Jerome N. Frank named to federal judgeship.

FPC authorizes license to Pacific Gas & Electric Cresta and Pulga projects.

MARCH

Detroit Edison Co. to spend $14,000,000 for expansion; 75,000-kw. unit to be installed at Delray power house No. 3.

Brazos River Conservation and Reclamation District to supply Possum Kingdom power to REA projects. Texas Electric Service Co. offer to buy entire output of dam rejected.

Niagara Falls Power Co. ready to put idle Adams standby plant into operation, Col. William Kelly, vice-president, announces. Awaits water diversion.

By overwhelming vote, Spokane rejects plan to buy distribution system of Washington Water Power Co.

SEC issues plan for Engineers Public Service Co., the second of its "blueprints."

Senate adds $10,000,000 to Independent Offices Bill for TVA.

E.E.I. trustees vote to file with SEC. Missouri Association of Public Utilities also files.

Consumers Power Co. to spend $14,000,000 on additions and improvements; expansion planned for Weadock and Morrow plants.

United States and Canada sign St. Lawrence pact. President Roosevelt sends text of agreement to Congress.

SEC issues third major "blueprint"—Commonwealth & Southern Corp.

President W. Alton Jones announces Cities Service Co. is preparing to withdraw from utility field.

Tacoma, Wash., municipal plant plans $11,000,000 expenditure for expansion. Shuns Bonneville power.

Northern States Power Co. will double capacity of High Bridge plant at St. Paul.

APRIL

Commonwealth Edison Co. plans $120,000,000 construction program, $40,000,000 of which will be spent in 1941. Company orders 12,500-kw. topping unit for Aurora, Ill., station to be ready in 1942.

Construction of $22,000,000 Grand Valley dam project on Snake River in Idaho approved by army engineer board.

Detroit Edison Co. to start work on Marysville power plant. Will make addition to plant to accommodate one 75,000-kw. turbo-generator and two boilers.

Philadelphia Electric Co. orders two giant units. Westinghouse to make 150,000-kw. turbo-generators for new $32,000,000 Southwark generating station. Will connect with power pool.

Edward C. Eicher elected chairman of the SEC to succeed Jerome N. Frank.

Seattle has blackout. Utility loads drop 58,000 kw.

National Resources Planning Board in annual report presents a six-year public works plan. Hydro-electric projects to cost more than $1,000,000,000.

Rankin introduces bill for "Seven TVAs."

SEC orders U.G.I. to sell nine units in system. Formal order directs system to divest itself of all holdings in utility properties outside tri-state area around Philadelphia. Company sells holdings in Connecticut Light & Power Co.

FPC cites Pacific Gas & Electric Co. on Cresta and Pulga projects.

Iowa-Nebraska Light & Power Co. sells all electric properties in Nebraska to Consumers Public Power District for $19,592,000.

Arkansas Power & Light Co. asks FPC authority to build $3,000,000 steam-electric generating station in "sour gas" fields of south Arkansas; initial capacity, 30,000 kw. Part of a six-year $10,000,000 program. Asks commission to set date for Blakely mountain dam completion.

Pacific Gas & Electric Co. makes proposal to purchase and market Shasta Dam power. Proposal substitute for Bureau of Reclamation's plan to construct 150,000-kw. steam plant to "firm" Central Valley power. P. M. Downing, Pacific Gas & Electric vice-president, testifies before House appropriation subcommittee.

President Roosevelt asks Congress for funds for immediate start on construction of 150,000-kw. steam-generating plant for Central Valley project.

Joseph L. Weiner, director of public utilities division of SEC quits to join OPACS. Robert H. O'Brien appointed to succeed him.

Carolina Power & Light Co. to spend $8,500,000 in two years to expand Cape Fear plant. Two 40,000-hp. units and boilers to be installed in defense plant expansion.

Secretary Ickes recommends to Congress and President Roosevelt construction of multi-purpose power and irrigation dam on Colorado River, to be known as Bullshead Dam; cost $41,200,000. Appropriation of $5,000,000 sought to start construction work on project; power capacity, 225,000 kw.

MAY

Administrator Slattery states REA is not to encourage co-operative generating plants; guiding purpose of agency is to build power lines for farmers.

House appropriations committee rejects Interior Department's request for $4,000,000 to start 150,000-kw. steam generating plant for Central Valley project.

Consumers Power Co. starts new 50,000 kw. addition to John C. Weadock generating plant.

Leland Olds, chairman of the Federal Power Commission, urges building of five hydro-electric power projects on the Broad River, north of Columbia, S. C.; cost $80,000,000.

Clatsop County, Ore., voters reject public power proposal.

Passamaquoddy project held not economical for present in report by Roger B. McWhorter, chief engineer of the FPC.

FPC terminates Arkansas Power & Light Co.'s license for Blakely Dam.

Niagara Hudson Power System plans expenditures of $20,250,000 in 1941 with major portion devoted to steam stations.

Philadelphia Electric Co. orders additional 80,000 kw. condensing unit for installation at Chester station. Also adding generating units at Deepwater and at new station.

Commonwealth & Southern Corp. plans to spend $43,000,000 in 1941 for plant additions.

Hartford Electric Light Co. orders 45,000 kw. steam turbine unit and 450,000 lb.-per-hour boiler for installation in South Meadow station; cost $4,000,000.

Sixteen utilities in southeastern states pool facilities with those of TVA to avert power shortage. Lowest water levels in 37 years. Voluntary curtailment sought.

By a 3 to 1 vote, Baker County, Ore., vetoes formation of a PUD.

JUNE

Edison Electric Institute meets in Buffalo.

Ganson Purcell appointed by President Roosevelt SEC commissioner.

U. S. Supreme Court extends flood control power to include tributaries of navigable streams, in decision rejecting efforts of Governor Phillips of Oklahoma to stop work on government Denison dam and reservoir project.

Los Angeles Water and Power Commission plans new 65,000 kw. steam-generating plant on site at Los Angeles Harbor.

Bonneville transmission system and system of Seattle City Light interconnected.

President Roosevelt asks legislation to authorize immediate development under agreement with Canadian Government of St. Lawrence project.

Ohio Edison breaks ground for new $3,600,000 addition to Gorge power station. Will add 40,000 kw. to Akron's power supply.

Empire State Gas and Electric Association votes to dissolve.

Arkansas Power & Light Co. orders second 30,000 kw. generating unit.

President Roosevelt asks Congress for additional $40,000,000 for TVA.

REA allots $200,000 to co-operative to carry power from Pensacola Dam to REA distribution co-operatives in Kansas, Arkansas, Missouri and Oklahoma.

Steel and copper go under OPM control.

FPC sees power shortage in 1941–42.

Burbank, Calif., Public Service Department to install two 10,000 kw. steam turbo-generators.

Niagara Hudson Power Corp. sets into motion long idle Edward Dean Adams standby hydro station following ratification by Senate of U. S.-Canadian diversion.

House approves $40,000,000 appropriation for TVA.

Initial funds for the second three 108,000 kw. generators at Grand Coulee Dam added to the Interior Department appropriation bill by the Senate. Amount provided by the Senate, $3,000,000. Appropriation for Central Valley, reduced by the House to eliminate the 150,000 kw. steam plant, further cut $3,000,000 by Senate to $31,750,000. Senate also reduces House appropriation of $5,000,000 to start Bullshead project to $3,000,000.

Alabama Power Co. to install 60,000 kw. turbo-generator in Gorgas station. Cleveland Electric Illuminating Co. plans 50,000 kw. turbo-generator installation at Avon power plant.

OPM names 24-man committee representing electrical manufacturing industry to provide liaison between government's defense arm and industry.

Columbia River Authority bill, providing for single administration of Grand Coulee-Bonneville power pool, introduced by Congressman Hill, Washington.

FPC initiates authority to order interconnections to meet emergency in drought-stricken Southeast. Utilities to link lines; defense requirements to be met from 17-state power pool to add 200,000 kw. of energy.

Philadelphia Electric Co. orders two 15,000-kw. turbo-generators for use in new Southwark generating station.

Indianapolis Power & Light Co. plans a $2,000,000 improvement program to include a new 37,500-kw. turbo-generator.

San Francisco must vote on Hetch Hetchy under Ickes stipulation. Court injunction restraining San Francisco from accepting $200,000 monthly from Pacific Gas & Electric Co. for Hetch Hetchy power extended to July 1, 1942.

Connecticut Light & Power Co. breaks ground for new 45,000-kw. addition to Devon plant.

JULY

Central New York Power Corp. adds second unit at Oswego ahead of schedule.

TVA and Aluminum Co. of America reach agreement for construction of Fontana hydro project on Little Tennessee River in North Carolina.

Pacific Gas & Electric Co. abandons construction of Pulga and Cresta plants.

REA dedicates Possum Kingdom Dam.

Krug asks power supply co-ordination for defense.

OPACS sets priorities for vital services.

FPC recommends that an RFC subsidiary be set up to finance power expansion. Urges that government assume greater responsibility for additional generating capacity.

Senate approves House bill appropriating $40,000,000 for TVA for current fiscal year.

OPACS holds conferences with electrical appliances manufacturers. Sees curtailment.

Leon Henderson resigns from SEC. Edmund Burke, Jr. named to succeed him.

OPM creates new agency to handle power program. J. A. Krug to head new unit with responsibility for defense power planning.

Four utilities plan new station units—Union Electric, 80,000 kw. generator for Venice No. 2 power plant; Public Service Co. of New Hampshire, 10,000 kw. for Manchester plant; Minnesota Power & Light Co., 33,500 hp. Duluth plant and Pacific Gas & Electric, new 9,000 kw. hydro plant on Yuba River.

Boston Edison Co. orders second 50,000-kw. turbo-generator for new Mystic station in Everett.

Ohio Public Service Co. dedicates its latest addition to Warren plant, placing in operation a new 35,000-kw. turbo-generator.

Secretary Ickes attacks FPC five-year power program.

SEC orders Engineers Public Service Co. to limit system.

AUGUST

Lack of materials forces REA to alter line-building program. OPACS and agency work out program of curtailment.

Public Service Electric & Gas Co. of New Jersey places 50,000-kw. turbo-generator in operation in the Marion station.

Vast REA public power pool for Arkansas promoted. Would tie in government projects in three states and build two 90,000-kw. steam stations to supply proposed aluminum plant. Utilities propose plan to save money and materials.

U.G.I. ordered by SEC to dispose of holdings in thirteen companies.

Potomac Electric Power Co. orders four 50,000-kw. turbo-generators.

Ickes to push program for government power. Approves San Francisco plan for $63,000,000 bond issue to purchase Pacific Gas & Electric system.

Kingsley Dam, Nebraska irrigation and power project on North Platte River, dedicated.

Associated Gas & Electric system to add to power supply. Operating companies will install 109,500 kw. this year and an additional 240,000 kw. by June, 1943. System has budgeted $42,692,639 for construction expenditures during current year.

Houston Lighting & Power Co. plans construction budget of $2,967,890 this year. Will build new plant near Houston to house 35,000 kw. turbo generator.

Blanket A-10 rating order given by OPM.

Wisconsin Electric Power Co. installs 35,000-kw. turbine in Commerce Street plant in Milwaukee.

Repair priorities program withdrawn.

Los Angeles Bureau of Power and Light orders second 65,000-kw. steam turbo-generator for Harbor steam plant now under construction.

SEC orders dissolution of National Power & Light Co.

SEPTEMBER

Supply Priorities and Allocation Board set up for defense administration. OPM power unit recognized as top planning agency for electricity supply. Donald M. Nelson executive director of the new board.

Federal order restricts installment credit terms for electrical appliances.

United Illuminating Co. pushes comprehensive program involving $10,000,000. Installation of 25,000-kw. addition made at Steel Point station at Bridgeport. Another 25,000-kw. unit for same plant ordered for 1943.

Central Illinois Public Service Co. announces plans for new 25,000-kw. generating station on Illinois River near Meredosia.

New 37,500-kw. turbo-generator put into service at Harding Street plant of Indianapolis Power & Light Co.

Cleveland Electric Illuminating Co. puts into operation new Lake Shore power plant.

David E. Lilienthal made chairman of

TVA board, succeeding Dr. H. A. Morgan, who becomes vice-chairman.

Utilities given blanket A-10 rating for maintenance repairs, and operating material.

RFC earmarks $150,000,000 for assisting utilities in financing additional generating and transmission facilities which FPC and OPM's power unit recommend for installation to serve growing war loads.

Third topping turbine goes in service at Waterside station of Consolidated Edison Co.—65,000-kw. unit.

RFC seeks funds to make loans for purchase of segments of utility properties which must be split up under the Holding Company Act. Bill introduced in the House.

New 100,000-hp. generating unit begins operation at Plant Atkinson of Georgia Power Co.

City of Glendale, Calif., orders second 20,000-kw. unit.

Three-year amortization plan developed by FPC. Niagara Falls Power Co. required to set up special accounts for defense facilities.

OPM orders 45 percent cut in refrigerator output.

OCTOBER

Electric Union Boycott illegal, referee finds. Local 3 of I.B.E.W. held monopoly in restraint of trade.

SPAB announces that all non-defense construction will be halted for the duration.

FPC holds utility conference in Boston to insure defense power for 1943 and subsequent years. Rationing of power postponed by rainfall. Meeting held also in Atlanta.

New hydro-electric plant near Glenville, N. C., goes into operation in aluminum production at Alcoa, Tenn. Companion plant at Nantahala, N. C., will follow on the line shortly.

Dallas Power & Light Co. files second request with City Council for approval to enlarge power facilities of generating plant at Mountain Creek lake. Council disapproved original request.

Entire household washer and ironer manufacturing industry certified to War Department by OPM.

Construction of eight dams now under way and steam-electric generating station at Watts Bar Dam will bring installed capacity of TVA system to more than 2,000,000 kw.

House votes $6,000,000 for Grand Coulee. Same appropriation bill includes $1,750,000 for Boulder Dam. Strikes out $3,000,000 for Central Valley and $40,000,000 additional funds sought by President Roosevelt for TVA to start construction of Fontana Dam.

Boston Edison Co. orders second 50,000-kw. steam-turbine generator unit for installation at new Mystic plant.

Duke Power Co. ordered by FPC to share hydro reserves to avoid power rationing.

OPM restricts civilian copper usage. Electric utilities exempt.

Experimental generating unit on Grandpa's Knob delivers 800 kw. during initial operations.

Nelson orders washer and ironer production cut.

Navy's plans delay utility turbine orders.

National Electrical Manufacturers Association sees defense program as challenge to industry. George C. Thomas, Jr., president of Thomas & Betts Co., elected president at New York meeting.

More than 400 electrical manufacturers attend conference in Washington on priorities sponsored jointly by NEMA and OPM.

NOVEMBER

Pooling and allocation organized in Southeast. Forty public and privately owned utility systems in thirteen states combine to supply power to drought-stricken area. Program administered from special Atlanta office of OPM with Power Co-ordinator J. A. Krug in charge.

San Francisco voters for the eighth time reject proposal to acquire municipal distribution system for Hetch Hetchy power.

Cincinnati rejects municipal ownership by a three to one vote.

Consolidated Gas Electric Light & Power Co. of Baltimore orders second 67,000-hp. generator for Riverside station.

Public Service Co. of Indiana orders 50,000-kw. generator for Dresser station and a 35,000-kw. unit for Edwardsport station.

Associated Gas & Electric Corp. trustees file report with court setting up four new, separate regional utility systems. Ten large utility companies will be sold and the corporation will be dissolved.

Curtailment postponed in southeastern area. Strengthened pooling operations, delivering in excess of 41,000,000 kw.-hr. per week, and rainfall in Tennessee Valley result in postponement of 30 percent power-rationing plan.

President Roosevelt asks $30,000,000 appropriation for Bonneville transmission facilities.

Burbank, Calif., completes 10,000-kw. outdoor turbine installation.

Central Maine Power Co. completing initial 20,000-kw. installation at Wiscasset steam plant. Two additional 10,000-kw. units have been ordered.

Dallas Power & Light Co.'s expansion plan again rejected by city.

United States and Canada agree upon additional water diversion at Niagara.

Montaup Electric Co. orders 35,000-kw. turbo-generating unit for Somerset steam plant.

Old Tacoma steam plant placed in operation. Bids out for two 25,000-kw. hydro units and one of 40,000 kw.

OPM limits power usage in Southeast.

Pacific Gas & Electric Co. starts work on two additional steam-electric generating plants, each of 60,000 kw. installed capacity, each to cost approximately $7,480,000.

Copper wire and cable manufacturers meet in Washington.

OPM issues amendments to Priorities Order P-46.

Krug announces indefinite postponement of proposed 30 percent cut in commercial and industrial power consumption in Southeast.

Federal government ousts State of Oklahoma from PWA-financed Pensacola Dam on the Grand River.

OPM urges Douglas Dam.

REA competes with utility companies for power contracts with defense industries in the Southwest. Two-million-pound supply of copper at Gilmer, Tex., transferred for use at Possum Kingdom hydro project gains priority rating.

$2,500,000 expansion of Quindaro power station No. 2 of the Board of Public Utilities, Kansas City, Kan., calls for addition of new 30,000-kw. turbo-generator.

Manufacturers of electric and combustion furnaces have been granted an A-1-c rating.

REA gets copper to finish pending projects. Fifteen-hundred-ton monthly allocation to be used for projects 40 percent completed. Congressman Winter of Kansas demands House investigation of charges that REA is sabotaging national defense by improper use of copper.

OPM orders 10 percent cut in vacuum cleaners.

Consumers Power Co. places 50,000-kw. turbo-generator in service at Bryce E. Morrow plant.

Construction of Umatilla Dam provided for in omnibus rivers and harbors bill. Located on the Columbia River, project is rated at 600,000 kw.

Consumers Power Co. and City of Lansing, Mich., agree upon 30,000-kw. interconnection between two systems to provide for emergency interchange of power.

DECEMBER

Following Honolulu attack, Pacific Coast utilities go on emergency schedules. Utilities place into full force FPC recommendations for plant protection. Floodlights on the dome of the nation's Capitol ordered turned off for duration. Some blackouts in East.

SPAB places restrictions on utility construction and orders "competitive" positions of public and private utilities be frozen.

Toledo Edison Co. starts operation of $4,500,000 turbine at Acme plant.

OPM lifts all restrictions on use of power in Southeast.

Lower quotas set for refrigerators by OPM.

OPM recommends Army Engineers begin surveys for government-built-and-owned high-capacity transmission line between Taylorville and Massena, N. Y., and start general surveys for possible line between Taylorville and New York City.

Public power advocates organize American Public Power Association, a nation-wide super-service company and trade association.

REA wins fight to serve aluminum plant at Lake Catherine, Ark.

Congress accepts Senator McKellar's substitute power program for TVA's proposed Douglas Dam project. Defense officials make another try to get funds to start project and proponents of the project succeeded in having a new measure drafted to start Douglas project.

OPM orders further cuts for washing machines.

Virginia Public Service Co. and Potomac Electric Power Co. complete connection to avert power shortage in Arlington County area.

Negotiations for power contract between Portland General Electric Co. and Bonneville Power Administration break down.

Intermittent blackouts on the Pacific Coast cut energy consumption approximately 3 percent.

OPM foresees power shortages in 1942-43.

DPC signs contract with private power companies in the Southwest which have agreed to pool generating facilities to supply 65,000 kw. of interim power for the government's big aluminum plant at Lake Catherine, Ark.

OPM amends basic priorities measure.

Detroit Edison Co. plans new 75,000-kw. generating station in Detroit.

Santee-Cooper project in South Carolina starts.

New 35,000-kw. turbo-generator put into service at Commerce Street plant of Wisconsin Electric Power Co.

Northwest companies to merge resources for war. Executives of nine large utilities inaugurate plans for material aid in emergencies, to include public power and municipal projects at meeting in Portland.

In Review

Highlights of past year that might be indicative of trends

S. B. WILLIAMS
Editor "Electrical World"

WHILE THE most important news of 1941 was Pearl Harbor on December 7, the year itself was one of an increasing war economy tempo. As material supply grew shorter priorities became stiffer. Industrial demands grew increasingly heavier, and with the added employment came serious labor disturbances. The output of electrical products and of electrical energy was stepped up rapidly. In spite, however, of the war growth in business, it could not be called a year of war profits. Higher costs of materials and labor, price ceilings and government regulation of profits, through taxes, have held net down sometimes to figures below that of the previous year.

Some Quick Statistics

Production of electrical energy by utilities in 1941 reached the amazing figure of 168 billion kw.-hr., 16 percent over 1940. It is an interesting note that the year's increase of 23 billion kw.-hr. is almost exactly the same as the total output at the time when the United States entered the first World War.

Some 3 million kw. of new generating capacity were added during the year, which was sufficient to take care of all but 600,000 kw. of the additional peak. Utilities, on the basis of the December noncoincident peak, still had a capacity reserve in excess of 20 percent. Scheduled additions for this and succeeding years of nearly 9 million kw., if not delayed, would appear to be ample to take care of the nation's needs.

Energy sales reflected the increase in war effort by jumping to 140 billion kw.-hr., more than half of which went to industrial customers. It was further reflected in the deceleration of the residential sales. There was not the same activity in building this class of load last year as there had been in previous years; in fact, the increase in usage by the average residential customer was only 34 kw.-hr.

Gross revenue reached a total of 2.7 billion dollars, a 9 percent gain, but expenses were up 12 percent, making the year for many companies one of profitless prosperity. Taxes, for instance, shot up to 20½ cents out of every dollar, while labor, fuel, supplies and maintenance were more costly.

As the year progressed there was a gradual diminution of new designs of equipment coming on the market. Substitutions began to take place for certain critical materials, but this was more noticeable in appliances than in the engineering equipment. The 2,500-lb. Twin Branch addition set a new pressure record for utility operation. Capacitors were used much more freely and the use of mobile equipment was extended to capacitors and generating stations. The Navy ordered two 10,000-kw. steam mobile generating units. Air blast for large breakers went ahead rapidly. An experimental 1,000-kw. wind-power unit was installed in Vermont to see whether such units in favorable locations might be dependable sources of power supply. A survey showed a trend toward increased letting out of construction work on contract.

As materials began to be more difficult to secure there was less tendency to junk old equipment, with a definite trend toward salvaging and the repair of old equipment.

The revised National Electrical Safety Code came out with changes in the loading map, liberalized transverse loadings and two specified grades for power line construction. Rules were added for buried cable.

Commercial

A marked tendency developed as the year progressed for utilities to turn over merchandising of appliances to dealers. The power salespeople were kept busy with rapidly increasing defense load. Lighting sales were extremely heavy in industry, with fluorescent leading in the new installations. Well over 600 installations of more than 50 ft-candles were reported. Several new street lighting installations were made.

A few companies developed appliance repair programs for domestic appliances. Installment selling went to larger down payments and shorter terms.

Drought

The year was marked by a serious deficiency in rainfall east of the Mississippi, with the most serious effects in the Southeast and in New England. FPC invoked for the first time its authority to order interconnections.

A voluntary rationing program was set up in the Southeast in June, but was withdrawn when the rains came in July. In the fall it was re-established under direction of OPM, but except for decorative and advertising lighting there was no curtailment. Late rains improved that situation as they did in New England. Nevertheless, the program of regional pooling and rationing as set up in the Southeast by OPM was expected to be a blueprint for any other regional power shortages that might develop. The pool involved 40 public and private systems in thirteen states.

An impending power shortage at Niagara Falls brought the idle Adams station into operation, first with 50,000 kw. and then 30,000 kw. more through the diversion of additional water. This additional power was allocated on priorities. The power company was allowed a 6 percent return on any additional investment required for this extra diversion, as well as complete amortization over a three-year period.

In addition to the Southeastern power pool, there was one connecting Idaho, Utah and Montana with a 277-mile line, one in California with 285 miles, one linking Kansas and Nebraska 265 miles, and additional long lines in the Bonneville area. A line to make available at Massena for aluminum production the power surplus of New York City was projected for construction by the Army.

Private utilities and government officials met in a series of six conferences to meet problems created by the rise in industrial production and by drought. Sixteen utilities west of the Mississippi acted to create a 65,000-kw. pool for temporary supply to the new Arkansas aluminum load.

Federal Power

Several new suggestions were made during the year for federally financed water power authorities; one for the Central Valley in California, a new one for 7 TVAs, one for the Dakotas, one for Arizona, and the biggest of all, the Arkansas Valley Authority, which would take over dams and reservoirs on four rivers in eight states. This latter brought a resolution from the governors of the affected states condemning it.

Grand Coulee started its first large 108,000-kw. generator in October. Elephant Butte started to supply service in New Mexico. Santee-Cooper was dedicated, Marshall Ford completed. Grand River was put in service and taken away from Oklahoma jurisdiction and put under federal operation. TVA jurisdiction was extended to the Cumberland River.

The Bureau of Reclamation and Secretary Ickes asked that all defense power, steam and hydro, installed west of the Mississippi be built and operated by them as government projects. A billion dollars in new hydro construction for post-war employment was proposed by the Government Planning Board.

Bonneville refused to sell 3,500 kw. to Eastern Oregon Light & Power, citing as one of the reasons that the company refused to sell its system. The agency also held up renewal of Portland General Electric contract, one of the stipulations being that the company agree to sell its system.

A feud developed over the type of control to be exercised over Columbia River, with the local people going out for home rule, the President for an independent authority like TVA.

Municipal Ownership

Outside of PUD's, there was very little growth in municipal ownership during the year. The two most important decisions were made in Spokane and San Francisco, where federal agencies brought all the pressure to bear they could for the purchase of local properties. In both cases the voters turned down municipal ownership by wide margins. San Francisco is now working for an amendment to the Raker Act.

In Nebraska the Consumers PUD purchased properties of Iowa-Nebraska Power, Interstate Power, Central Power, leaving virtually nothing in the state in private hands outside of the Nebraska Power Company. South Carolina Public Service Authority purchased the South Carolina Utilities Company. While PUD's were voted down in some districts in the Northwest, condemnation proceedings were started in several instances, the right of the PUD's to condemn having been confirmed by the United States Circuit Court of Appeals.

Regulation

The number of rate decreases was much smaller than in any of the past several years, the only one of size being a four-million-dollar cut by Philadelphia Electric.

Tax clauses were studied by several commissions, with Oregon and Arkansas permitting and Massachusetts denying. The New York commission stated in its annual report that high taxes prevented rate cuts. FPC invoked the prudent investment theory for the first time in the State Line case. Wisconsin commission for the first time included going value in acquisition prices.

Federal Circuit Court of Appeals ruled that FPC cannot regulate rates on licensed hydro projects unless the state commissions involved have failed to do so.

Several interesting orders with respect to publicly owned operations were handed down during the year. Coops in Iowa and Platte Valley Public Power and Irrigation District were required by FPC to obtain licenses. The Vermont commission told the city of Rutland that complainants must bear the cost of inquiry against a utility. Pennsylvania Senate passed a bill requiring municipalities to secure from the state commission certificate of convenience where cost is more than $250,000. Tennessee commission refused petition of coop customers to change over to private utility on the grounds it must protect the public from overlapping competition.

Several companies were cited for hearings by FPC on compliance with uniform accounting and historical costs. Among these was the wholly intrastate Hartford Electric.

A number of super-coops were formed during the

year to act as generating or transmission companies, or both, for member coops. In several instances the lines were under construction, the most ambitious being in Texas and Oklahoma to take Grand River and Brazos power to Arkansas under approval as defense projects.

The number of new REA projects diminished the latter part of the year due to inability to get material under priorities except for such projects as were substantially under way.

Integration

Utilities were told at the Buffalo E.E.I. convention by SEC Chairman Eicher that the defense program would bring no curtailment of administration of the Public Utility Act. More progress was made in the matter of disintegration of holding companies during the year than in any previous period. The orders of SEC to U.G.I. permitting the retention of but one closely knit system centering in Philadelphia was recognized as a blueprint for future breakdown of holding company systems.

Cities Service is planning a wholesale withdrawal from the industry, Standard Gas to dispose of all but Pittsburgh, Engineers to dispose of Puget Sound and Key West by next summer with limitations to either Virginia or the Gulf. Commonwealth & Southern permitted to hold Consumers or Alabama or Georgia, North America limited to one system, Electric Power & Light to retain southern system, disposing of western.

The question of what would happen to "orphans" brought about a 150-million-dollar RFC fund for use by municipalities or others. Close upon House approval of the fund, an association of public power advocates was formed.

Taxes

New revenue bill brought 3 1/3 percent energy tax, 10 percent tax on appliances and a 5 percent tax on lamps.

Several actions were taken with respect to public operations. Ohio refused any special consideration to coops. Nebraska rejected a bill to tax public power on acquisition from private companies. New Mexico reduced coop tax assessments to $20 per circuit mile.

Labor

There were more instances of labor unrest last year than in any previous year. Several elections were held to determine bargaining groups, with independent unions winning in several instances. Efforts at organization were centered on power house groups, several strikes were averted by arbitration. The strike at Kansas City, however, met with such public disfavor that a new trend was seen away from strikes that would stop service. The Michigan governor appointed a special commission to mediate Consumers trouble. Disturbance in St. Louis went to arbitration, likewise New York City.

Richmond, Ind., municipal was not permitted to enter into labor contract. In the Cincinnati municipal ownership election the union opposed the sale of the company's property to the city.

After several years of litigation, Local No. 3 I.B.E.W. boycott in New York City was held by United States District Court referee to be a monopoly in restraint of trade and should be enjoined.

The most serious manufacturing strike was that at Allis-Chalmers, which started on January 2 and was not settled until April.

Legal

Hopson of Associated was found guilty on seventeen counts of mail fraud and received five-year sentence. Union Electric was fined for violation of Corrupt Practices Act and charter forfeited with stay of execution.

Illinois Supreme Court upheld the right of a city to force removal of equipment from city streets following expiration of utility franchise.

Public Relations

The outstanding activity of the year in public relations was the beginning in December of a national advertising campaign sponsored and paid for by a group of operating companies.

Finance

RFC earmarked $150,000,000 to finance additional generating and transmission capacity recommended by FPC in its five-year program. Mississippi Power and Gulf Power applied for RFC aid. Several companies reduced dividends during the year.

Power Supply

FPC released a five-year program calling for construction of additional capacity at the rate of 2½ million of steam and 1 million kw. hydro annually through 1946. This program was attacked by Secretary Ickes as "ill advised and carelessly prepared."

Priorities

Utilities received A-10 ratings for repair and maintenance, including minor construction. Major construction took project ratings, while emergency repairs went through as special high ratings. Inventories were frozen.

Utility turbine schedules were delayed by increased Navy requirements. All appliances received curtailment orders in varying degree. Price ceilings were instituted on copper, insulators, several types of appliances.

War

Although several test blackouts had been made on different properties from time to time, there was major confusion when the war broke out on December 7, due to lack of information from OCD. Plant and property protection was increased and intensified measures taken to prevent sabotage.

Roof signs in certain districts were ordered taken down. In some cities street lighting was reduced.

Daylight saving bill was introduced in Congress.

The year just passed might be called "A year of preparation for war." The year ahead for the electrical industry will be one of "All out for Victory."

Manufacturers All-Out

Production in 1942 almost entirely on war requirements and related needs—Half of last year's volume of over $4,000,000 for military needs—Gain in output during year is 75 percent against 25 percent for general industry

GEORGE C. THOMAS, Jr.

President, National Electrical Manufacturers Association

NOW ALL THAT COUNTS is Victory—complete and final.

To that task the electrical manufacturing industry now dedicates itself. We have manned our battle stations in factory, office and shop. Machines are whirring. Goods are moving rapidly to all fronts.

The electrical manufacturing industry holds a key place in this Victory campaign we now must wage. Its contributions are vital to every phase of the effort.

One important factor in this effort will be the work of the National Electrical Manufacturers Association. Already, under the leadership of NEMA, big strides have been made to establish standards and conditions helpful to the whole electrical industry.

Greater emphasis will now be put on assisting all branches of the electrical industry in the host of new and trying problems brought about by war. The NEMA organization is equipped to cope with these matters. Its committees and trained staff, and the specialists on whom it can call, are ready to provide technical and engineering assistance for emergencies.

Peak Output

A foretaste of what can be expected from the electrical manufacturing industry under the spur of war is given by its record of accomplishment in the year just closed. To a larger degree than most industries, we had already swung over to expanded war production. A recent survey among electrical manufacturers revealed that 86 percent of the companies reporting were devoting more than half of their production to wartime needs; that is, to A-10 ratings or better. Industry in general, at the same time, was devoting not more than 15 percent to 20 percent of production facilities to such output.

Now, our industry's production for 1942 will approach complete concentration on direct war requirements and related needs.

To meet government and civilian demands in 1941 manufacturers added heavily to production capacity. On the basis of returns, 61 percent of electrical manufacturers enlarged plant facilities. It was estimated, before December 7, that a further 14 percent would increase their plant capacity. But now, with war a reality, a still greater increase is looked for.

Output in 1941 reached a peak unequaled in the history of the electrical industry. Electrical manufacturers turned out a record total of $2,000,000,000 worth of electrical goods for direct military needs, and more than an equal volume for indirect defense and other requirements.

Those figures are big in themselves. But they are even more impressive when compared with the preceding year, itself a good production year. Total output for 1941 is estimated at 75 percent above 1940. Industry in general showed only a 25 percent gain, according to Federal Reserve Board indices.

All-Out Effort

As we enter 1942, electrical manufacturers, in spite of the 1941 production, find themselves with huge backlogs of orders. Further large increases in most lines are certain as the war machine goes into high.

To meet the flood of requirements, manufacturers are already intensifying production efforts. Output will be pushed to the limit to keep pace with the expanding demand.

Besides additions to facilities, other measures are being taken. As one of the most important steps, plants are being worked longer hours. More days are being added to the work-week; added shifts are being put on. As against a former average of 40 working hours a week, many plants are going to 168 hours a week. That means 24 hours a day, seven days a week.

Not stopping there, plant executives are planning to use every possible expedient to get out more goods. Within the factories studies are being made to take better advantage of space, to handle material more efficiently, to cut down even the smallest delays and stoppages.

And they are looking outside for more facilities. Subcontracting, to bring the productive power of small plants to bear, will be sought vigorously.

The most serious limitation to our output is the supply of raw materials.

Although the curtailment of civilian goods will release

large quantities of scarce materials for war needs, there will still be a shortage. Because of the essential nature of electrical goods, our factories will receive preferred treatment in allocating the steel, copper, brass, zinc and other scarce commodities.

It becomes our responsibility, therefore, to take appropriate action along two main lines:

1. To conserve scarce materials in every way possible so as to use our supply to the best advantage from the standpoint of war output.

2. To bend every effort to develop substitutes which can be used in place of scarce materials without affecting the functional efficiency of our products.

Electrical manufacturers are fully alive to these twin responsibilities. Some manufacturers have assigned their entire research departments to war work of this kind. Most companies will carry on their regular research and development work in conjunction with this emergency activity.

Encouraging discoveries of acceptable substitutes have been made. Such materials as vitreous enameled steel, plastics, vitreous china, plywood casings, and molded wood-pulp are among those which have been put to successful use in place of critically needed metals.

Not only have these metals been conserved for actual munitions, but improvements in electrical products have been brought about in many cases through the use of substitutes. That's a practical demonstration of what American ingenuity can do.

Sacrifices

There have been and will be sacrifices. Many manufacturers, for example, will have to curtail or drop lines in order to conserve scarce materials. Until recently electrical manufacturers as a whole have suffered little, but as the campaign broadens and deepens more and more inroads will be made into output that does not get into the sinews of war or serve public health and safety. Already a large number of manufacturers have voluntarily eliminated parts of their lines as willing contributions to victory, and will do much more.

Outside influences will also affect our operations in the year ahead. First in importance is governmental supervision of the conservation and distribution of raw materials, working chiefly through OPM. Such supervision is, of course, essential to direct the country's immense war production effort. Ever-changing requirements for a multiplicity of reports and the necessity for extension of a great variety of ratings have swamped electrical manufacturers. On the whole, considering the difficulties and problems involved, it has been capably and fairly administered, and it is recognized that OPM is conscious of this burdensome problem and is moving toward relief.

NEMA and individual manufacturers have cooperated, wherever requested, with OPM; have helped in the formulation of some of the plans and in smoothing some of the difficulties. Even so, we must expect them to continue, perhaps in more stringent form, as the "sights" of the war program rise.

As manufacturers look ahead, they find themselves unable to forecast, even from month to month, what production will be required, what materials will be available, or what new regulations will be imposed. Planning of operations obviously is difficult. But manufacturers are going ahead to cope as well as possible with these necessary conditions, while continuing cooperative efforts to lighten and clarify the restrictions.

George C. Thomas, Jr.

Another prime consideration is labor. It is likely that the actual onslaught of war will bring about a new spirit in which questions and disputes can be more readily settled. Government can help still further by a fair-and-square attitude toward both parties.

All manufacturers are operating under a great many other difficulties and are confronted with many other problems, such as protection against sabotage, training of additional workers, training of supervisory forces, and a terrific strain on top management.

Post-War

Absorbed as they are in the gigantic task of meeting production demands, as many as 75 percent of electrical manufacturers are finding time to think and plan for what will follow when peace returns.

The studies that are going forward, in which NEMA will play a leading part, are designed to provide a constructive post-war program with these broad aims:

To smooth the transition to normal production.

To make available generally the advances in the electrical art brought about under the stress of war.

To meet the enormous demand which will have accumulated for consumer goods.

But neither these studies nor anything else will be allowed to interfere with the primary job we now face. America, in her hour of need, looks to our industry to furnish an ample supply of those crucial products without which modern war and modern civilian life could not continue.

We cannot fail. We will not fail.

Editorials

S. B. WILLIAMS, *Editor*

Coming Events, Shadows of ——

DECELERATION in the rate of increase of electricity sales to residential consumers is one of the signs and portents to be seen in the statistical picture of the electric utility industry presented in this issue of ELECTRICAL WORLD. What this sign means is less clear than what it portends.

It cannot be said that the reduction in rate of increase in this class of sales results from limitation on production of electric appliances. In general, such limitation did not become effective until the end of 1941, which was, actually, a year of very high production of these goods. Some utilities slowed up or abandoned their own merchandise sales efforts in the year, but as an offset they greatly increased their encouragement of dealer selling. Toward the end of the year probably fewer appliances were being sold to users, but this can not account substantially for the slowing up of residential energy sales. Restrictions on installment purchases had their effect, but this again was a development of the second half of the year and could not have been a large contributor to the deceleration.

Over against these and other brakes on increase in residential sales is the fact that 1941 was a year of improvement in employment, a condition that would be expected to cause more people to use more electricity in their homes. It is doubtful that a war-inspired disposition toward frugality made its appearance in the homes of the people long before Pearl Harbor.

Although the deceleration is not easily explained, what it indicates is clear. With drastic reductions in appliance production, with taxes claiming sizable portions of each man's earnings, with daylight saving cutting the light bill and with appeals for economy in the use of electricity, it is plain that a much slower rate of increase in residential electricity sales can be expected in 1942. In fact, it is more likely that there may be a decrease unless strong efforts are made to sell continuity of use. Where selling stops, buying falls off.

The Broader Viewpoint of Regulation in the Public Interest

UNDER emergency conditions "business as usual" is frowned upon by government and the public. This heading, however, covers other things than mere buying and selling. It might be construed to include regulation. At least the Massachusetts Department of Public Utilities thought so last week when it refused to order a state-wide telephone rate investigation.

"In our nation's present crisis," said the decision, "the company is commendably and capably serving in a 'capacity in the common endeavor.' Moreover, the resources of the company are needed by the nation. It would not be in the public interest to intervene at this time."

Equally important in the service of the nation during war, if not more so, is the electric utility industry, supplier of the number one raw material. Its resources, both of men and of money, are needed by the nation as never before. Why can't other regulatory bodies be as conscious of the country's good as the Massachusetts commission?

Why does the chairman of the Federal Power Commission find it necessary at this time to step beyond his judicial bounds to state that more government competition with utilities is necessary? Why does SEC feel that the administration of the disintegration section of the Utility Act should proceed regardless of the harm it does to the suppliers of the basic raw material? Why do certain members of Congress continue to use the Congressional Record to vent their hatred for electric utilities and to continue to drive for St. Lawrence and Arkansas Valley Authority?

Can't the people in Washington forget their own personal prejudices until this war is over? Can't they be as generous in their aversions as other people are with money and resources?

If regulatory bodies want to do their part in this war they can do nothing better than to see to it that electric utilities are kept from being pestered, that their time is not taken up by unnecessary hearings, that their resources are kept healthy for the job they have to do. The war is going to take a great many of the industry's men. It is going to take all of the industry's financial reserves to build new plant. Help it to do the job by protecting it from those who would weaken it when it should be strongest.

We do not mean to imply that regulation should be put away in mothballs for the duration. Far from it. We do urge, however, that there be a moratorium on fishing expeditions, that hearings which are not absolutely necessary but which take men away from essential work be postponed, that wherever possible unessential statistical reporting be held up, that red tape be cut so that utilities can be free to do their war job without annoyance.

The Massachusetts commission is to be commended for a kind of regulation that sees the public interest in the broad, rather than the narrow, sense.

The Cable and the Strand

ONE OF THE MOST interesting developments of recent months is the way in which operating company executives are sensing the need for working together on national problems. Last June when SEC Chairman Eicher told the E.E.I. convention that there would be no reprieve for holding companies we urged the local operating people to find leaders, develop organization, establish a sound public policy and then to try their case before the court of public opinion.

Leaders are now beginning to appear. Men are showing more courage. Going fast is that old spirit of helpless bitterness and in its place is developing the thought that perhaps the public cannot be blamed for thinking ill of the industry when so few people have made any effort to tell the public the truth, the whole truth and nothing but the truth.

The first appearance of this desire for cooperative action by local companies came with the national advertising campaign. It doesn't represent all the companies it should, nor does it have a budget as large as it ought to have. Nevertheless, it is a beginning in mutual effort. Before the year is over there will be other evidences of the reawakening nationally of the local operating companies.

The handwriting is on the wall. Most of the holding companies have come to a decision as to what to keep and what to sell. There will be many orphans. Will they be weak, or will they pool their strength, and through leaders and organization, with sound public policy, defeat those influences which would destroy private initiative?

Recently we saw a million and a half pounds applied to a stranded cable before it parted. To every one of the small wires this pull was exerted, but they did not break sooner because they were banded together, and in this cabling each derived the strength of the whole. This is the lesson the operating companies are now learning. Not all of them, for there are still some of the larger companies that prefer to have no outside alliances. The number of strands in the cable, however, is growing and, as it does, there is realized the added strength of union, which is a basic tenet of the life of this nation.

OPM's Answer to the Question of Power Supply

LAST YEAR the utilities installed 2,278,000 kw. of steam turbines, this year the manufacturers will be permitted to deliver to utilities 2,290,000 kw. While this represents only 83 percent of scheduled installation in 1942, it is considerably more than was expected as the result of the Navy demand for more manufacturing space.

It is possible that as the year advances even some of this total may have to be deferred, but at present this is the allocation being made by OPM. Even with the 17 percent deferment the figure represents the largest kilowatt capacity of steam turbines ever delivered to the utility industry in a single year.

All of this will not get into service in 1942 because of year-end deliveries, but it will be balanced by a similar condition in 1941, so that the net result of the two years should be about the same.

The allowance of this amount of new steam capacity this year, in view of the strenuous efforts of the Navy for more manufacturing space, is splendid evidence that OPM is not going to permit one branch of the armed services to handicap another. This would appear to be the answer of OPM to the question of power supply.

Replacements for Selectees

BY THE END of this year we may expect to see our army trebled in size, and that may be only the beginning. Where will these men come from? Most of them will be taken from industry.

There will be no essential industries as there were in the last war, no exemptions—only deferment. Key men, as before, when they can prove their necessity, will be deferred, but even then the deferment is only temporary. In those cases employers have the responsibility of training replacements for men who otherwise would be selected for service. Men with dependents will continue to be deferred.

General Hershey, who is in charge of the draft, has no desire to cripple any organization. On the other hand, he has to fill an army, and since the men for combat must for the most part come from the group between 20 and 27 he must not be handicapped by requests from employers for deferment of men who are not absolutely necessary.

Replacements for selectees may come from the over-age group, from the physically unfit, from those with dependents, and from women. With all industry being required to release its young men to the combat forces, there are not going to be enough males to go around. Women, as in the last war, must take their place in industry.

The time to start training women is now. There may be whole departments they can take over. The deferred men in these departments will then be available for replacements either in the company or in some factory where they are badly needed.

It might also be necessary to postpone retirement programs for the duration, and even to recall some of those retired for jobs fitted to their strength. There may be other ways to handle the situation through doubling up, through abandonment or modification of certain work, but the time to start plans is now.

Registration will be here in three weeks and shortly after that selection will proceed. When the call comes the electrical industry should be ready either with replacements or with a program for handling the work of these men.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

The New War Production Boss

THE IMPORTANCE of the President's elevation of Donald M. Nelson to be America's "war czar" cannot be overestimated.

White House delegation of authority to Nelson is intended to be complete and absolute—it extended even to letting Nelson write his own ticket in framing the executive order under which he will function. What Nelson wants, and needs, in the way of authority to direct the war program he now has and the White House backs this up by terming his decisions "final."

Procurement Also

Not only does Nelson assume full command over production matters, but he also has direct supervision over the vital key to any successful production program—procurement. This means Nelson can "dictate" purchase contracts for the military, that he can direct financing of new plant facilities through the Federal Loan Agency.

Signing of contracts and of loan authorizations remain where they were, but they become subject to Nelson's "veto" in both a negative and an affirmative sense. This "veto" will not be an *ex post facto* thing, either; Nelson expects to assign crack civilian purchasing men to work alongside the Army and Navy procurement officers.

It has been a lack of any such coordinated authority which has caused much of the pulling and hauling in the war effort to date. When the military, or Jones, didn't agree with the defense agencies, or vice versa—as too often happened—there resulted a stalemate which could only be broken by getting the matter to the President's attention.

Appointment of Nelson as big boss and delegation to him of the necessary working authority should, and can, end all this. It leaves only the question mark of who bosses labor.

That's the "revolution" in administrative mechanics which President Roosevelt has worked by naming Nelson his supreme commander on the home front of production. The revolution in the "human equation" is perhaps even more important and significant.

Both among the New Dealers and the $1-a-year men in Washington (with a few exceptions) Nelson is conceded to be best equipped for the role of top man. As Director of Purchases for OPM in the pre-SPAB days, Nelson quickly built a remarkable record. He continued to be the outstanding executive in the defense setup after SPAB was created, as executive director of this policy group, but his effectiveness was fettered by the fact that he was also subordinate to OPM as its Director of Priorities. Time and again Nelson directed OPM to undertake certain steps to carry out a SPAB policy, only to have nothing happen.

Copper Production

An important illustration was SPAB's declaration, proposed by Nelson, that prompt steps be taken to increase the production of copper —whatever steps were necessary. Nelson intended to assign his own "trouble shooter" to the job, but the day after SPAB's session, at an OPM meeting, William S. Knudsen took jurisdiction of the assignment on the grounds that he was Director of Production. That occurred three months ago. It was only last week that a program of "premium" prices for production over 1941 levels was worked out.

The new setup should prevent a repetition of such incidents. Knudsen has been put into uniform as a lieutenant-general in the Army to be the nation's "field general" on production matters, where, untroubled by policy problems, the auto maker is an acknowledged leader. Other elements of OPM will become functional operating agencies each in a particular field, much as the Power Branch has been carrying on under J. A. Krug, and responsible directly to Nelson.

Krug, and others like him in OPM who have kept their mind on their jobs and have steered clear of the struggle for power and authority, are expected to move easily into the leading roles under Nelson's régime. Those in OPM who do not fall into this classification are certain to be eased out, more or less precipitously; there may be quite a number of heads roll.

"Get-the-Job-Done" Wins

It should not be forgotten that there was a terrific struggle for authority preceding the President's latest shakeup. It was the natural fight between the $1-a-year business man and the government bureaucrat. It also was the fight between men in both categories who called for getting the job done even if it meant stepping upon a lot of toes and the men, again in both groups, who held back for fear of the effects of their actions—upon themselves, their futures and the futures of business or bureaucratic authority.

Nelson's emergence on top means that those whose first interest is in getting the job done have decisively won out. Broadly catalogued—and with the notable exception of Leon Henderson from the government group—these winners come largely from the $1-a-year camp. They are the ones who will be interested in relinquishing "regimented" control of industry just as soon as this is practical after the war is over so they may get back to their own jobs. They also are the ones who—more than the bureaucrats looking to continuation of their jobs—are interested in seeing the initiative of private business enterprise revive quickly in the post-war period.

A revealing anecdote illustrates Nelson's frame of mind on this subject. When Power Chief Krug brought up to Nelson a recommendation for canceling the Limitation Order covering the Southeastern power curtailment program Nelson remarked:

"You ought to go down in history as the only fellow in government who ever moved in on something and had sense enough to pull out when the need for the regulation was over."

NEWS OF THE WEEK

Links for Arkansas Pool Win Commission Approval

Subject to priorities on materials, commission permits construction of three high-voltage lines, making resources of 1,500,000 kw. pool available to aluminum plant

The Arkansas Department of Public Utilities has approved the application of Arkansas Power & Light Co. to construct three short links necessary to complete a high-voltage transmission power pool which will make 65,000 kw. of interim power available to the Defense Plant Corporation's new aluminum plant under construction at Lake Catherine, Ark.

When construction is completed, a vast pool of power, embracing eleven utilities located from Nebraska to Mississippi, with a capacity of 1,512,300 kw., and reserves totalling 218,040 kw., will be available for the needs of the aluminum plant (ELECTRICAL WORLD January 17, 1942, page 3).

Subject to Priorities

Permission to build the three transmission links was made conditional upon the Arkansas company filing within 30 days evidence that necessary priorities and materials for the construction had been obtained.

Evidence that these may soon be forthcoming was expected in Arkansas due to the commission's decision, after lengthy hearings, that the line proposed by the Ark-La "holding company" co-operative from Pensacola to Lake Catherine was a waste of capacity, copper and money.

C. S. Lynch, executive vice-president of Arkansas Power & Light, stated at hearings that while the pool had contracted to supply power to the aluminum plant on June 1, the Defense Plant Corporation hopes to have part of the plant ready by May 15 and will want power at the earlier date.

The lines authorized by the commission consist of a 74-mile connection between Ashdown and Lake Catherine, 104 miles from Little Rock to Norfork Dam and 10 miles from Lake Catherine to Remmel. A great deal of the preliminary work necessary on these lines has been completed, Mr. Lynch testified.

No Intervention

The Ark-La Electric Cooperative, which had appeared the previous week in hearings before the commission seeking permission to construct a new line from Markham's Ferry to Lake Catherine, was represented at the latest hearing, but did not intervene or file objections.

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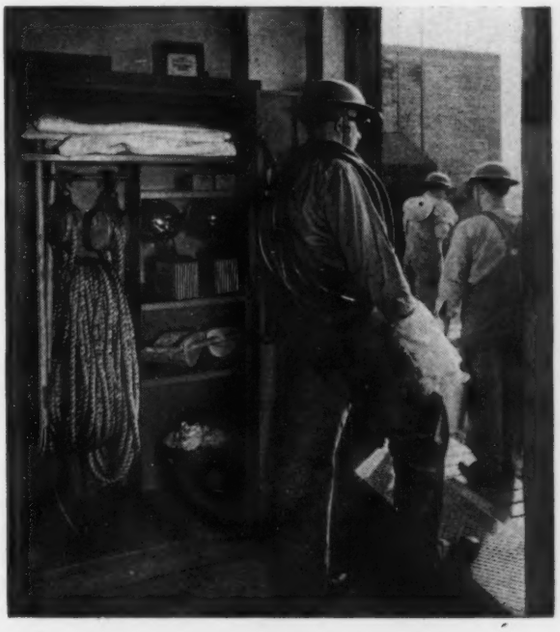
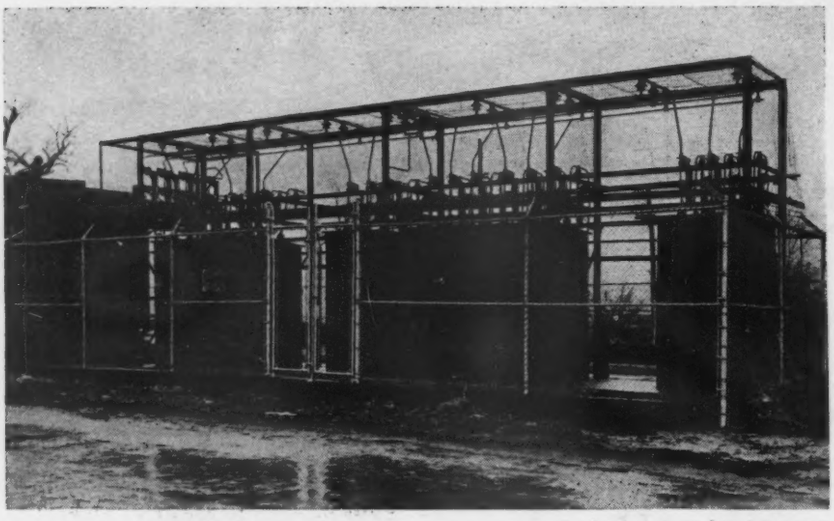
Seeks Merger of Public Power Bodies

Representative Everett M. Dirksen, Illinois Republican, this week proposed that all federal agencies dealing with power—including both regulatory and operating units—be consolidated into a Federal Power Agency. In a formal statement released to newspapers at the Capitol, Rep. Dirksen suggested that the President could effect the reorganization under his war powers.

Specifically mentioned by Rep. Dirksen for inclusion in the proposed new agency are the National Power Policy Committee, Federal Power Commission, Tennessee Valley Authority, Rural Electrification Administration, Bonne-



FOR INCENDIARY BOMBS — Seventy-eight emergency cabinets like this one have been installed near the roofs of commercial buildings owned and operated by the Consolidated Edison System in New York City to cope with possible fires caused by incendiary bombs. One hundred and fifty of the system's commercial buildings employees have received intensive training in the use of the equipment in the cabinet and an additional 1,450 employees also have been instructed in its use in case of emergency



DISCOURAGING SABOTEURS—Complete screening of overhead 13.8-kv. buses against short circuiting from without the property, combined with stout wire fencing capped by barbed wire, metal cubicles on a concrete platform above flood level and distributed floodlighting, guard this 3,000-kva. utility substation against hostile intentions in a seaboard community in the East. Local 2,300-volt feeders leave the property underground. All padlocks were changed immediately after Pearl Harbor

ville Power Administration, the power activities of the Bureau of Reclamation and those functions of the National Resources Planning Board dealing with power resources.

"The federal government has already gone far in the field (of public power)," Rep. Dirksen pointed out, "and the time is at hand to gather up the scattered agencies in the federal structure in order to give unified direction to this policy and eliminate waste and inefficiency."

Creation of the single agency would unify the government's power development program, Rep. Dirksen contended. Biggest job probably would be composing sharp differences among New Deal public power advocates themselves to arrive at any single program.

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E.E.I. Sales Conference Scheduled for March

With the advent of war imposing entirely new and additional responsibilities upon utility sales executives, the Edison Electric Institute announced this week that the annual meeting generally known heretofore as the "Annual sales conference" will take place this year at the Edgewater Beach Hotel, Chicago, during the week of March 22.

Instead of a normal sales program, however, the entire program will be reoriented to assist utilities' organization for the Victory Program recently outlined by President C. W. Kellogg (see ELECTRICAL WORLD, January 17, 1942, page 10).

The conference dates are March 24, 25 and 26, to be preceded by a day of committee meetings on March 23. All sessions will be general sessions, all of which will be open to manufacturers and others interested in the new problems with which utility commercial organizations must cope during the war period.

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Two-Price System on Copper, Lead, Zinc

In an effort to stimulate domestic production of copper, lead and zinc for the war effort, a two-price system has been worked out by government agencies to become effective in February.

Reserve Metals Co. has agreed to a recommendation from OPM and Price Administrator Henderson that it purchase production in excess of specific quotas at premium prices. The government hopes by this method to increase domestic output of zinc and lead nearly 30 percent and of copper by at least 10 percent.

Quotas for individual mines will be fixed by Henderson, based roughly on their 1941 output. The excess will go to Reserve Metals at these prices: Copper, 17 cents; zinc, 11 cents, and lead, 9¼ cents per pound, premiums of 5 cents for copper and 2¾ cents for zinc and lead over established "ceiling" prices set for OPA.

The two-price arrangement is strictly a war measure. Even with the increased production from higher prices it is not anticipated that the supply picture will be materially relieved. Growing war demands will keep pace with any growth in supply.

NEWS BRIEFS

FROM PRESIDENT MITCHELL to the newest office boy, employees of West Penn Power Co. are to be finger-printed by company representatives. At the same time photographs will be made for identification cards to be provided for employees who make calls at customers' plants engaged in essential war production.

MEMBERS OF LOCAL B-1289, International Brotherhood of Electrical Workers, have passed a resolution directed to officers of Jersey Central Power & Light declaring that because of the vital importance of continuous and uninterrupted service members will aid in every possible way so that the company may render 100 percent service at all times in the defense of the Nation.

TRAFFIC LIGHTS IN Albany, N. Y., now have a piece of cardboard placed behind the glass lens with a narrow cross cut out near the top of the cardboard. It is reported that this device is providing satisfactory traffic control both in normal day and night operation and during blackouts.

BLACKOUT INSTRUCTIONS for industrial plants are being issued by the Electrical Association at Buffalo. Rule No. 1 is: Don't pull the main switch, as this stops elevators, ventilating fans, fire and hose pumps, stoker and oil burner motors, as well as other essential equipment.

AN INDEPENDENT UNION, the Public Service Employees Union, won the right to represent office, clerical and technical division workers in Wisconsin Gas & Electric. Electrical distribution workers voted 134 for A. F. of L. and 17 for an independent union.

SEVERAL ARMY BALLOONS with long, steel trailing cables broke loose from their moorings near Seattle recently, one of them blowing over a high voltage transmission line north of the city and interrupting service for upward of thirty minutes.

TWO FAMOUS GUIDES to New York Harbor, Fire Island lightship and Scotland lightship, are being removed by the Coast Guard as part of a program to eliminate lights around the harbor.

AN IMPORTANT POINT TO NOTE in the San Francisco blackout is that blackout orders were issued when unidentified planes were detected eighty miles off the Pacific Coast.

War Topics Dominate at Iowa Utilities Conference

Need for preserving appliance distribution channels, recent developments in blackout techniques, adequate wiring and service reliability topics at Des Moines conference

George W. Allison, Modern Kitchen Bureau, told Iowa utilities association conference in Des Moines last week that the industry needs a national heavy appliance program vastly more today than it did when there were plenty of appliances to sell. Today, he said, the industry faces the possibility of having its distribution channels "shot to pieces." In the face of these conditions he urged utilities to see that their customers get full usefulness from the appliances that they have, to sell what appliances they have selectively, replacing old appliances first and to keep the public sold on appliances to provide a starting point after the war.

Blackout Equipment

William G. Darley, General Electric Co., Nela Park, discussed and demonstrated recent developments in blackout technique and lighting equipment. A high-sensitivity photometer for measuring brightness under blackout conditions and a light barrage technique for confusing enemy bombers were new developments mentioned. Other devices included special blackout flashlights and automobile headlamps, fluorescent lamps and painting street lights and blackout flash bulbs for press photographers.

A. E. Schanuel, National Adequate Wiring Bureau, asked utilities to work closely with agencies and interests promoting privately financed homes for defense workers to the end that the minimum amount of critical materials will be used to best advantage and to insure provision for inexpensive additional outlets when materials again become available in the future.

Decision to use 115 kv. for the new 32-mile backbone transmission line of the Iowa Electric Light & Power Co., according to A. B. Hird, was because double the transmitting capacity was obtained at 5 percent increase over the alternate 69-kv. design considered. The line, which is expected to go into operation in February, performs the function of tieing together the three main generating points on the system and making firming capacity available at Marshalltown from Cedar Rapids, where 75 percent of the system generating capacity is located.

In discussing shielding of transmission lines for lightning protection, J. L. Culhane, Iowa Power & Light Co., stated that application of shielding or protector tubes, depending on economic conditions, was becoming of vital importance in lightning protection of transmission lines because of increased dependence on electric service under war conditions.

J. P. Wentling, Consolidated Treating Co., discussed the history of the wood preserving industry and described the new pentachlorophenol treatment for preventing sapwood rot in the out-of-ground portions of cedar poles as a natural adjunct to effective and established butt treatments.

Ralph Yerk, Hughes Brothers, in discussing the application of H-frame distribution structures to alley construction, stated that due to the variation in the type of service for light and power as supplied by alley circuits it is rarely desirable to either build or rebuild using conventional single-pole construction.

Longer spans, fewer structures and attachments tend to balance the cost between H-frame and single-pole construction, he stated.

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Civilian Lighting Organized on Coast

The civilian defense light coordination committee of Los Angeles County, California, which supervises the release of civilian defense lighting information during the emergency, is comprised of members of the electrical industry, practically all of whom are members of the Illuminating Engineering Society, Southern California section.

The men were appointed to the committee through the efforts of George M. Rankin, Southern California Edison Co., director of lighting, who saw in the circulation of lighting inaccuracies during the first days of the war the need for an official committee manned by an informed personnel to release accurate information to the public.

Through the committee, the public is advised to use ordinary lighting at all times until a blackout is ordered. Then proper means of making a structure light-tight makes it possible to use ordinary interior illumination during a blackout. Information on approved means of obscuration is provided by the committee, which also maintains activities in research, engineering, camouflage, street lighting and searchlighting.

Operating under the Los Angeles County civil protection committee, the light coordination committee is headed by Frank A. Hansen, I. E. S. regional vice-president. The administrative subcommittee consists of G. M. Rankin, Edison Co.; T. H. Shepherd, Los Angeles Bureau of Power and Light; B. F. Delanty, Pasadena light department; Peter Diederich, Glendale public service department, and J. H. McCambridge, Burbank light department.

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Government Buys Out Nebraska Properties

Consumers Public Power District of Nebraska, which a year ago purchased certain Nebraska properties, has now purchased Nebraska and South Dakota properties of Western Public Service Co.

By reason of this transfer the state of Nebraska follows in the footsteps of the state of Tennessee in becoming a state served predominantly by governmental facilities. The only sizable public utility company remaining in Nebraska is Nebraska Power Co. at Omaha.

The price paid by the government agency for the Nebraska and South Dakota properties is approximately $7,100,000 plus cash balances in the treasury of each company, with adjustments to be made for unbilled service and current assets. Approximately $3,909,000 will be deducted to redeem bonds in the hands of the public and other funds required to call publicly held preferred will leave net proceeds of approximately $3,100,000.

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Makes Recommendations on Highway Lighting

In accordance with President Roosevelt's proclamation for 24-hours-a-day safety, the Illuminating Engineering Society has recently issued a statement recommending that during this emergency, street and highway lighting be especially applied where it will promote the productive and fighting capacity of the country and provide for the safety of those engaged in the production and transportation of necessary material.

"Particular attention," the statement continues, "should be directed to the lighting of streets and roads essential to transportation and the roads servicing plants, encampments, and other concentration points where there are hazards to life and property."

Added Turbo-Generator Bolsters Central Maine

With a 20,000-kw. unit on the line at the new Wiscasset plant and a normal water year President Wyman sees company prepared for all demands

Central Maine Power's new steam plant at Wiscasset, named the Mason station, in honor of Frank H. Mason, chief engineer of the company and of Nepsco Services, Inc., at Augusta for many years, began to deliver energy to the transmission system on January 1, a little more than a year after the beginning of construction. The initial installation comprises a 20,000-kw. G. E. turbine unit with steam generating and auxiliary facilities.

Shortage Unlikely

In announcing the completion of the first unit at Mason station, President Walter S. Wyman said that it appears unlikely that there will be any shortage of electric power in northern Maine this winter. Occasional rains have occurred during the past few weeks and by careful handling of water the company now has almost as much water in storage as was available October 1, 1941, besides being three months nearer the spring run-off, when for a time at least an ample supply of water can be had.

The completion of the Wiscasset turbine brings the total steam capacity of Central Maine Power to about 70,000 hp. and the combined steam capacity of Central Maine and the Cumberland County Power & Light (Portland) companies to about 110,000 hp.

Last June Central Maine ordered an additional 27,000 hp. in the boiler, turbine and condenser capacity for the Wiscasset station. These were originally promised for shipment for June and July, 1942, two turbine units of 10,000 kw. each being scheduled. Delivery dates have now been pushed ahead into 1943 on account of the war, and the company does not feel at all sure when these later turbines will finally be received.

Mr. Wyman stated, however, that having just been through twelve months of the lowest rainfall on record in Maine, and now having 27,000 additional horsepower in steam capacity ready for use, the company does not feel disturbed at the delay and believed that it will be able to carry its load in any ordinary water year even with the additional demand for defense operations which will undoubtedly be placed upon the company in the coming months.

Mason station will utilize oil firing for the boilers for the present as about three months' work remains to be done in completing the installation of the coal-handling equipment. Earth excavation for the foundation of the second and third units is well along and work on the removal of ledge will start at once.

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McKellar Ends Fight on Douglas Dam

Senator McKellar of Tennessee has paved the way for quick Congressional approval of the construction of the Tennessee Valley Authority's $32,000,000 Douglas Dam, asserting in a letter to President Roosevelt that since the Commander-in-Chief of the Army and Navy insisted on it he had no course but to acquiesce and fight it no longer.

He told the President he felt there was "no justification for the destruction of this fruitful French Broad River Valley, so necessary to the furnishing of food to our Army and Navy, and especially for such a comparatively small amount of power as can be generated at Douglas Dam."

Last week President Roosevelt asked Congress for an appropriation of $30,000,000 to start work on the dam.

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Union Negotiates Covenant with REA

Farmers served by REA cooperatives will probably be surprised when they learn that a "covenant" has been negotiated between REA in Washington and the International Brotherhood of Electrical Workers which specifies desirable wage schedules for employees of the co-ops and provides for annual conferences between REA, the IBEW and representatives of the cooperatives.

The covenant does not bind REA to insist that co-ops recognize the union. The official language is that "cooperation between management and employees is indispensable to the accomplishment of the public purposes for which REA has been established."

In return for this "blessing from headquarters," the union promises to use its machinery to avoid strikes in REA cooperatives. It agrees also to (1) create state councils of maintenance men, a "select group" equipped by natural aptitude for the job and (2) institute a program of education among REA maintenance men designed to make them conscious of the semi-public nature of their work.

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Army Says Red Light Better in Blackout

The War Department announces that extensive tests by the Corps of Engineers have revealed that under blackout conditions a deep red light is much more satisfactory than the widely accepted blue light.

"Blue is more easily observed from the air and is less helpful to ground activities than any other color," it was stated in the release.

At least one European country now at war, it was said, has abandoned blue illumination in recent weeks after more than two years of use under blackout conditions.

Deep red is less visible from the air, gives better illumination on the ground and aids the eyes in becoming and remaining adapted to near or total darkness, it was reported. A person stepping from deep red illumination into darkness suffers little discomfort.

However, there are practical disadvantages to the indiscriminate use of red light, it was stated. The possibility of confusion with tail lights exists if deep red were used for lights on motor vehicles. Since red illumination is not normal, it may, if not properly used, betray the installation which is to be concealed.

The practicability of the use of properly hooded, low-intensity white light in lieu of colored illumination should not be underestimated. All factors considered, properly hooded low-intensity white light is more generally applicable to blackout illumination problems than colored illumination.

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Fire Destroys Offices

A fire which broke out in the center of the Chester, S. C., business district early January 16 destroyed the two-story brick Pryor Building, housing the offices of the Duke Power Co., and another building, damaged other structures and plunged the city into darkness for several hours. The fire was described as the most disastrous in the city's history.

AT MISSOURI VALLEY SALES MEETING—(Left to right) G. S. Young, Kansas City P. & L. Co.; H. E. Roberts, Empire District Electric Co.; R. A. Graves, Kansas City P. & L. Co.; E. A. Nickelsen, Interstate Power Co.; R. A. Lind, Iowa Illinois Gas & Electric; S. A. Lipscomb, Empire District Electric Co.

Small Industries Must Seek Sub-contracting

Delegates to Missouri Valley Electric Association sales conference report customers' apathy — Nebraska Power protecting industrial power contracts — Power salesmen urged to be stabilizing influence

The small industrial business man cannot hope to secure defense subcontracts unless he becomes more aggressive than he has been to date, utility power salesmen reported at Kansas City last week. Delegates to the Missouri Valley Electric Association annual power sales conference, reporting conditions in key industrial cities of Iowa, Nebraska, Kansas, Missouri and Oklahoma, said many small industrial firms have been following the mistaken belief that defense contracts will come to them without effort. Largely because of this attitude tangible results activated by OPM's defense train in terms of contracts let have not been as great as hoped for, in spite of active power sales cooperation with OPM.

Pool Resources

One noticeable tendency since the declaration of war has been the pooling together of several small firms to bid on a single contract. Work and revenue is then divided among the firms.

W. H. Stueve, Oklahoma Gas & Electric Co., Oklahoma City, reported that 80 percent of the year's increase in industrial load accrued during the last six months of 1941 and 106 industries in his area out of a total of 5,600 industrial customers accounted for 93 percent of the increase. He recommended that power salesmen find out which of their industrial customers are bringing about the greatest increase in load and concentrate on helping these industries to improve power factor and load factor.

Ford Bates, Nebraska Power Co., Omaha, said that his company has introduced four provisions into its industrial power contracts to guard against changing production costs. They are: (1) a correction for the cost of fuel; (2) a correction in proportion to any increase in directly allocable taxes over August 1, 1941; (3) a correction proportional to percentage change in non-allocable taxes; (4) correction proportional to changes in the commodities index.

George Weckel, Kansas Gas & Electric Co., Wichita, reported that of the nearly 170,000 kw. of electrical load represented by army cantonments in the 7th Corps Area (roughly corresponding to Missouri Valley area) all but 20,000–30,000 kw. was supplied by private utilities.

Duane Landon, St. Joseph Railway, Light, Heat & Power Co., St. Joseph, Mo., urged power salesmen to exert a stabilizing influence on their customers under present conditions, give calm advice on blackouts, help industry keep its feet on the ground and, through better acquaintance, lay groundwork for post-war competitive influences.

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Purcell Heads SEC

Commissioner Ganson Purcell was formally elected chairman of the Securities and Exchange Commission this week to succeed Edward C. Eicher, who has been appointed Chief Justice of the United States District Court for the District of Columbia. Mr. Purcell was advanced to a commissionership last spring after having served as director of the SEC's trading and exchange division.

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Ordered to Revise Rates

Massachusetts Public Utilities Commission has ordered the Worcester County Electric Co. to revise rates downward in the Webster area. New rates will save customers an aggregate of $40,000 annually. The Worcester Suburban Electric Co. will also revise rates, effecting a saving of $14,000 to customers.

AT POWER SALES MEETING AT KANSAS CITY—(Left to right) H. F. Hemker, Kansas Power Co.; K. O. Houser, Kansas G. & E.; J. H. Tarbell, Kansas City P. & L. Co.; G. H. Molesworth, Missouri Public Service Corp.; N. T. Tweet, City Light & Traction; D. A. Herman, Kansas Power Co.; B. J. George, Kansas City Power & Light Co.

Power Branch Goes to Production Board

OPM's Power Branch, under J. A. Krug, goes intact under the new War Production Board in the realignment of the war administrative setup following appointment of Donald M. Nelson to supreme and final authority over production and procurement. Krug, whose relations with Nelson are known to be excellent, is certain to remain in charge of the power program.

While OPM as a separate identity fades from the picture, its materials division shifts over under Nelson's direct supervision. Power branch is a unit of this division and will report directly to Nelson.

Nelson's authority, furthermore, is sufficient to bring all federal power agencies under his jurisdiction in so far as the war program is affected. The executive order creating the war production board specifically gives Nelson authority to make all plans and policies regarding the war program and directs the several federal departments and agencies to comply with them.

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Orders Power Equipment for Green Mountain Dam

Transformers, oil circuit breakers and disconnecting switches have been ordered by Secretary of the Interior Harold L. Ickes for the power plant at Green Mountain Dam on the Colorado-Big Thompson project in Colorado. The Colorado-Big Thompson project was recently placed in the national defense category and materials ordered for the Green Mountain plant receive a preference rating by the Office of Production Management. Contracts awarded amounted to $208,618.

Allis-Chalmers Manufacturing Co. for a price of $143,350 will furnish three 115-kv. transformers and five 69-kv. oil circuit breakers. Pennsylvania Transformer Co. will furnish seven 69-kv. transformers at $54,698 and the Memco Engineering & Manufacturing Co. will supply for $10,570 five 69-kv., three-pole disconnecting switches, thirty-three 69-kv. and nine 7.5-kv. single-pole disconnecting switches.

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Cadmium Use Restricted

Use of cadmium for a long list of articles, including a number in the electrical field, will be prohibited after February 1 under terms of Order M-65-a, issued this week. The list of banned items includes air-conditioning equipment (except where plating is essential to proper functioning of the parts), conduits, lighting fixtures, portable heaters, stoves and ranges (except valves and controls), washing tubs and machines, electrical fittings (except where cadmium plating is essential because of corrosive action or to proper functioning of the parts), and pole-line hardware.

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Eicher Nomination Upheld

A favorable report on the nomination of Edward C. Eicher, chairman of the Securities and Exchange Commission, to be chief justice of the District of Columbia Federal Court has been made by the Senate judiciary committee.

MEETINGS

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 26-30. H. H. Henline, national secretary, 29 West 39th St., New York, N. Y.

American Society of Heating and Ventilating Engineers—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., January 26-29. A. V. Hutchinson, secretary, 51 Madison Av., New York.

Great Lakes Power Club—Winter meeting, Statler Hotel, Detroit, Mich., January 30. R. P. McClellan, secretary, Consumers Power Co., Grand Rapids, Mich.

Edison Electric Institute — Electrical equipment committee, William Penn Hotel, Pittsburgh, Pa., February 2-3; transmission and distribution committee, Hotel Cleveland, Cleveland, Ohio, February 9-11; annual sales conference, Edgewater Beach Hotel, Chicago, Ill., March 23-27. Major H. S. Bennion, managing director, 420 Lexington Av., New York, N. Y.

American Institute of Mining and Metallurgical Engineers—Annual meeting, Institute headquarters, New York, February 9-12. A. H. Parsons, secretary, 29 West 39th St., New York, N. Y.

National Electrical Manufacturers Association — Midwinter meeting, Palmer House, Chicago, Ill., February 16-20. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

North Central Electrical Industries—Biennial electrical convention week, Radisson Hotel, Minneapolis, Minn., February 22-25. W. A. Ritt, secretary-manager, 234 Foshay Tower, Minneapolis, Minn.

American Society for Testing Materials — Committee week and spring meeting, Hotel Cleveland, Cleveland, Ohio, March 2-6; annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 22-26. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

Greater New York Safety Council—Annual safety convention and exposition, Pennsylvania Hotel, New York, N. Y., March 3-6. Greater New York Safety Council, Lincoln Bldg., 60 E. 42nd St., New York, N. Y.

Canadian Electrical Association—Western members, joint meeting with Northwest Electric Light & Power Assn., Business Development Section and Commercial Section, Vancouver, B. C., March 4-6. B. C. Fairchild, secretary, 804 Tramways Bldg., Montreal.

Southeastern Electric Exchange—Engineering and operating section, Sir Walter Hotel, Raleigh, N. C., March 12-13. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, Ga.

Oklahoma Utilities Association — Annual convention, Biltmore Hotel, Oklahoma City, Okla., March 23-24. Miss Kate A. Niblack, secretary, 625-626 Biltmore Hotel, Oklahoma City, Okla.

American Society of Mechanical Engineers — Spring meeting, Rice Hotel, Houston, Texas, March 23-25. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Missouri Valley Electric Association—Annual engineering conference, Hotel Continental, Kansas City, Mo., March 26-27. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln, Neb.

Crowley Elected Head of Philadelphia Co.

Leo T. Crowley, chairman of the Federal Deposit Insurance Corp., has been elected president of the Philadelphia Co. of Pittsburgh. Frank R. Phillips, who has served as president of the company for many years, was elected chairman of the board and the executive committee. Mr. Crowley also is president of the Standard Gas & Electric Co., which controls the Philadelphia Company.

Among the executive changes made in companies affiliated with the Philadelphia Company system was the election of P. H. McCance as president of the Duquesne Light Co. to succeed Mr. Phillips.

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Lighting Regulation Planned for Canada

The bright lights of several Canadian cities may be dimmed each night in the interests of security under provisions of an amendment to Defense of Canada Regulations approved by government order-in-council. The amendement was to a regulation providing that Hon. Ian MacKenzie, Pensions Minister, or any person authorized by him may by order prohibit or regulate the display of lights of any description.

Preamble to the new order sets forth "that in view of the increasing danger to the people of Canada of bombing and bombardment it is advisable to make restrictions upon the display of lighting, to wit, those areas which have been organized for Air Raid Precautions under the provisions of the Defense of Canada Regulations."

Areas considered subject to hazard of enemy attack were recently extended for A.R.P. purposes and they include large portions of both the Atlantic and the Pacific coasts.

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President Orders Daylight Saving Feb. 9

Nation-wide daylight saving time goes into effect at 2 a.m. February 9 as a war measure put through both as a power "conservation" step and, in the limited areas of possible bomb attacks, to get people home earlier.

The bill, signed by President Roosevelt, provides year-around "fast" time for the duration, to become effective on the 20th day after enactment into law. This measure was accepted over a Senate bill which would have permitted the President to advance clocks by two hours in designated areas.

Characteristic Drop Shown in Output

The amount of electrical energy distributed by the electric light and power industry for the week ended Saturday, January 17, was 3,450,468,000 kw.-hr., according to the Edison Electric Institute, the decrease of 22,000,000 kw.-hr. from last week being some indication that in 1942 the total output may follow its characteristic pattern and decline until April or May.

Many in the industry are, however, looking for only a slight decline on the basis that "round-the-clock" operation of industrial plants will require added kilowatt-hours to a degree that will cancel the usual seasonal decline.

One more new factor this year will be the advent of daylight saving time on February 9 and annual savings of 736,282,000 kw.-hr. are expected by the Federal Power Commission.

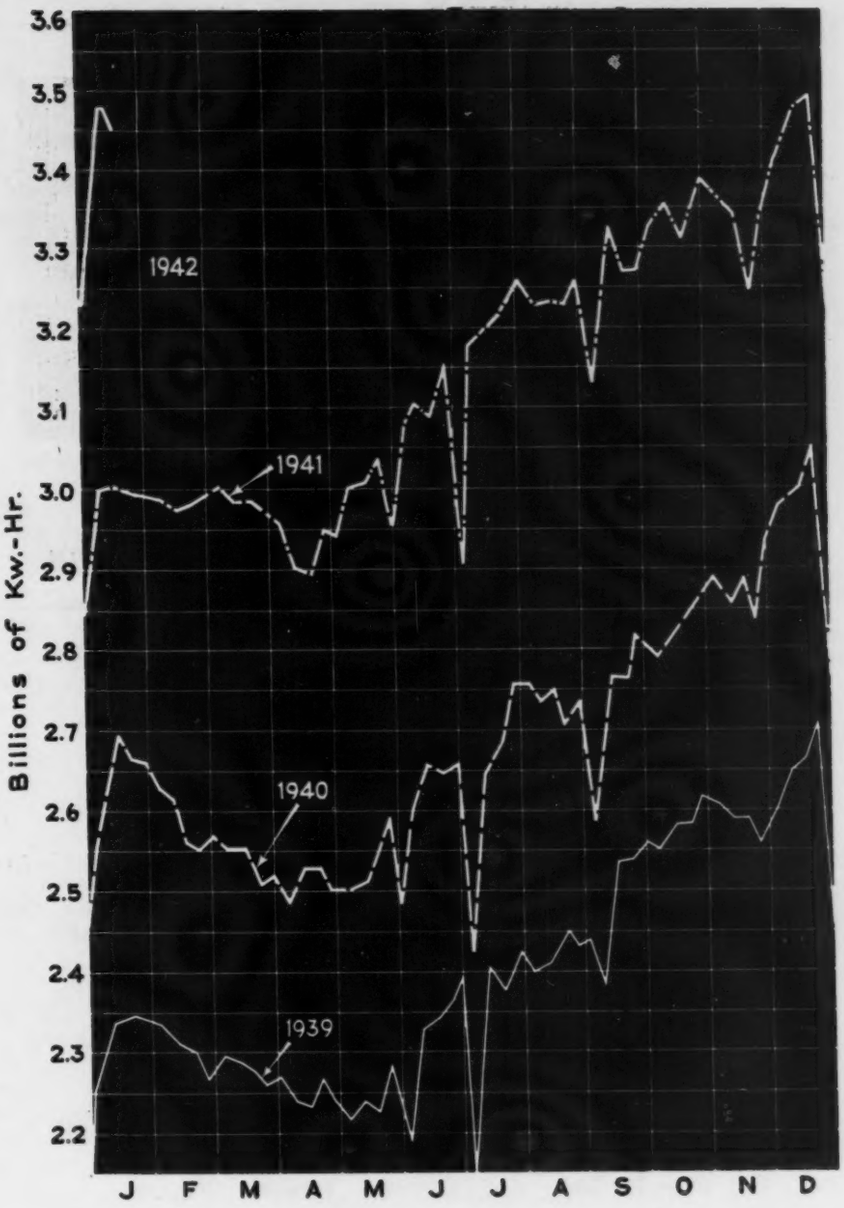
Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
Jan. 17	3,450	Jan. 18	3,013	Jan. 20	2,674
Jan. 10	3,473*	Jan. 11	3,002	Jan. 13	2,688
Jan. 3	3,289*	Jan. 4	2,846	Jan. 6	2,558
1941		1940		1939	
Dec. 27	3,234	Dec. 28	2,757	Dec. 30	2,464
Dec. 20	3,495	Dec. 21	3,052	Dec. 23	2,712
Dec. 13	3,476	Dec. 14	3,003	Dec. 16	2,674
Dec. 6	3,415	Dec. 7	2,976	Dec. 9	2,654
Nov. 29	3,293	Nov. 30	2,932	Dec. 2	2,605

Percent Change from Previous Year

	Week Ending		
	Jan. 17	Jan. 10	Jan. 3
New England	+16.4	+18.1	+16.9
Mid-Atlantic	+11.0	+12.8	+11.5
Central Industrial	+12.9	+14.5	+13.7
West Central	+14.3	+14.4	+13.8
Southern States	+15.4	+17.9	+17.8
Rocky Mountain	+15.8	+13.9	+16.2
Pacific Coast	+23.0	+22.7	+24.5
Total United States	+14.5	+15.9	*+15.6

* Revised.



Windsor Capacity Totals 300,000 Kw.

The new 60,000-kw. G.-E. superposed turbine at the Windsor power station is already in operation, increasing the capacity of the station, which is jointly owned by West Penn Power and Ohio Power, to 300,000 kw.

In 1939 Ohio Power added a 60,000-kw. unit and West Penn started work on the new 60,000-kw. generator in May, 1940.

Two Combustion Engineering steam generators, each designed for 750,000 lb. per hour at 1,350 psi. and 925 deg., are now in operation also.

To provide for increased output from the new unit an additional transformer bank consisting of three 25,000-kva., 11/132-kv. transformers has been installed at the station, a new bay has been added to the 132-kv., switchyard and new switching facilities provided.

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William M. Scott Dies

William M. Scott, president of the I-T-E Circuit Breaker Co., Philadelphia, Pa., died at his home in Paoli on January 19, at the age of 69. Mr. Scott's entire career was devoted to the development and manufacture of electrical apparatus.

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Rockland Utility Upheld

The Appellate Division of the Supreme Court, Third Department, in the case of Rockland Light & Power Co., appellant, vs. the City of New York, respondent, by a three to two decision, has reversed the order and judgment of the supreme court dismissing the complaint. The case involves the right of the Rockland utility to file a claim for damages on account of a dam which the city of New York is constructing for water supply purposes on the Neversink River above power sites of the plaintiff.

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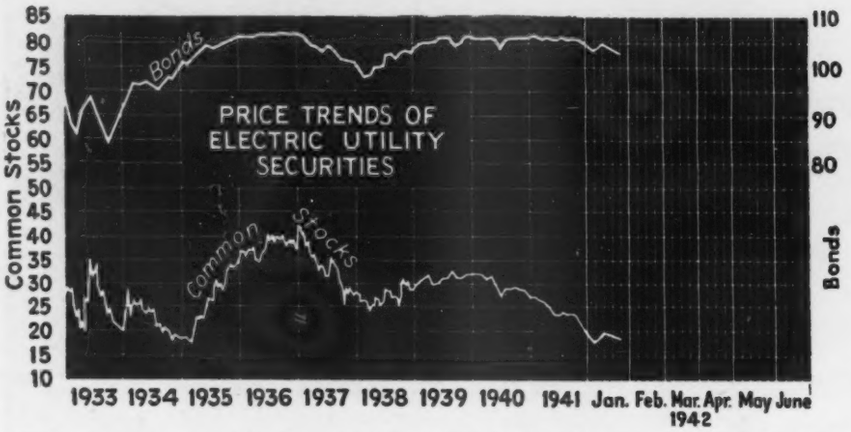
Energy Uses Advance

Electric energy requirements for October totaled 14,721,784,000 kw.-hr., a gain of 17.5 percent over the same month last year, according to the report issued by the Federal Power Commission. Corresponding peak demands, up 12.7 percent over October a year ago, aggregated 29,781,038 kw., according to reports received from Class 1 electric utility systems.

Utility Securities Move in Narrow Range


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1933 1934 1935 1936 1937 1938 1939 1940 1941 Jan. Feb. Mar. Apr. May June 1942

Slight changes occurred in the prices of electric light and power securities the past week. "Electrical World" stock index dropped to 19.7 from 19.8 the previous week; last year, 26.8. Bonds turned upward—104.8; last week, 104.6; last year, 106.4

North American to Sell Union Electric

North American Co. has applied to Securities and Exchange Commission for authority to sell its holdings of 2,695,000 shares of common stock of Union Electric Co. of Missouri through a selling group to be headed by Dillon, Read & Co. in a move toward further retirement of North American debentures.

The announcement gave rise to considerable speculation in New York financial circles. Reference was made particularly to the statement of North American's President Edward L. Shea at the stockholders' meeting last April that the company could not perform any important holding company services if its investments were restricted to but one out of four operating groups.

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Holders Will Vote on Stock Exchange

National Power & Light Co. has called a special meeting of its common stockholders for January 28 to vote on a proposal to retire 250,000 shares of the company's $6 preferred stock. The retirement of the preferred would be effected by offering in exchange two shares of common stock of the Houston Lighting & Power Co., a National subsidiary, for each outstanding share of National $6 preferred.

National Power owns all the outstanding 500,000 shares of Houston Lighting common stock and has outstanding 279,716 shares of its own $6 preferred stock. The exchange offer, which has been passed on by the SEC, is a further step in the dissolution of National Power & Light in conformance with the integration provisions of the Public Utility Holding Company Act.

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L. I. Lighting Loses Case in State Court

The Court of Appeals has affirmed an Appellate Division decision dismissing the complaint of the Long Island Lighting Co. against the New York Public Service Commission on the ground that the complaint failed to state a cause of action. The utility sought a declaratory judgment that the commission in its investigation of the company's books did not have jurisdiction to make an order requiring it to write down (by charges to surplus) certain actual costs of its investments, to new and different values now determined by the commission.

On January 27, 1937, the commission instituted an investigation of the company's accounting practices.

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Plans $25,000,000 Issue to Finance Extensions

To provide additional funds for its expansion the Commonwealth Edison Co. of Chicago is negotiating with a group of insurance companies for the sale to them of $25,000,000 of its 3 percent thirty-five-year first mortgage bonds, Charles Y. Freeman, chairman of the company, has announced. Mr. Freeman estimated that the company will spend more than $100,000,000 in 1942, 1943 and 1944 for generating equipment and extensions to plant and property.

Underwriters Offer Alabama Power Issue

Public offering of the $80,000,000 Alabama Power Co. first mortgage bonds, the largest utility issue ever to have been awarded at compulsory competitive bidding under SEC rule U-50, was made this week at 101¾ and accrued interest, subject to clearance being granted by the Securities and Exchange Commission.

The 30-year bonds were sold at 100.40 to a group of 81 underwriters headed by First Boston Corp. and Bonbright & Co., Inc., which set an interest rate of 3½ percent. Interest cost to the company is approximately 3.4784 percent.

The company will use proceeds of the issue together with $12,000,000 of bank loans (carrying 2⅞ percent interest) and treasury funds to redeem or pay its entire mortgage debt, outstanding principal amount of which is $95,583,600.

In connection with the financing, Commonwealth & Southern will make an added investment in Alabama Power common stock by surrendering for cancellation 340 shares of Alabama $5 preferred 5,282 shares of $6 preferred and 5,680 shares of $7 preferred at a cost of $717,482.

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Energizes Power System

The city of Grand Coulee, Wash., near Grand Coulee Dam, recently energized its municipal power distribution system with power generated at the dam and at the same time made an over-all reduction of 25 percent in retail electric rates. Reduction in residential rates amounted to 27 percent. Since it purchased the distribution system from a private utility the city has been securing power from Consolidated Builders, Inc., contractor at the dam. Grand Coulee purchases its power through a contract with the Bonneville Power Administration at the at-site rate of $14.50 per kilowatt per year.

Utility Reports

	Net Income 1941	1940
*Connecticut Light & Power	$3,756,511	$4,057,638
*Cons. Gas Elec. Lt. & Pwr. (Baltimore) and sub	6,424,509	6,427,010
*Consumers Power	9,374,244	11,056,329
*Georgia Power	5,398,682	4,206,511
*Gulf States Utilities	1,987,729	2,411,250
*Key West Electric	78,924	46,785
*Northwestern Electric	477,411	473,236
*Ohio Edison	3,992,850	4,094,677
*Puget Sound Pwr. & Lt. and subs	2,471,009	2,006,379
*Virginia Electric & Power	3,927,101	4,117,100
*Western Public Service and subs	184,055	180,756

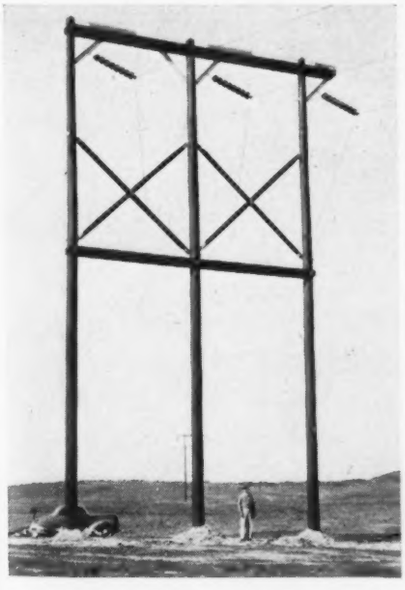
*Twelve months ended November 30.

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

Pole Lines

Creosoted Poles Used for 63-Mile Line

Structures made of creosoted Douglas fir poles were used when the San Diego Gas & Electric Company built a 63-mile, 132-kv. transmission line to connect the Mission Valley substation at San Diego with



THREE-POLE angle structure. Note the bird guard over each set of insulators

a line of the Southern California Edison Company at Capistrano.

The line consists of three conductors of 250,000-cir.mil, 19-strand copper, is 3 to 5 miles from the ocean, somewhat parallels the coast line, reaches altitudes ranging from 200 to 2,000 ft. above sea level, traverses a rough terrain and is in a region where flying and subterranean species of termites are active.

Poles and timbers for the line structures as well as pole anchors were pressure treated with 8 lb. of coal-tar creosote per cubic foot by a standard empty-cell process.

Structures are the H-frame type except at eleven angles, where the three-pole type is used. Span lengths vary from 180 ft. to 1,800 ft., average for the line 750 ft. Poles are A.S.A. Class 2, ranging in length from 50 to 75 ft., average is 60 ft.

For spans 1,200 ft. and less the H-frame structure poles are set 12 ft. 9 in. apart and the top 2 ft. was slab-gained prior to treatment to provide uniform thickness of $8\frac{1}{2}$ in. at the section where the crossarms are attached, 15 in. below the pole top. The poles are connected by a double crossarm 26 ft. long and made up of two $3\frac{3}{4}$x$6\frac{3}{4}$-in. timbers bolted through the poles. Three $5\frac{3}{4}$x$8\frac{1}{2}$-in. spacer blocks (a 2-ft. length for each end and a 5-ft. length for the center) were bolted between the crossarms.

For spans over 1,200 ft. the H-frame structures are similar, except that the poles are set 14 ft. 9 in. apart and crossarms are 30 ft. long.

The three-pole structures are knee braced at the top. In addition, a two-timber horizontal strut is used to brace the poles, 22 ft. below the crossarms, and by X-bracing placed above the strut.

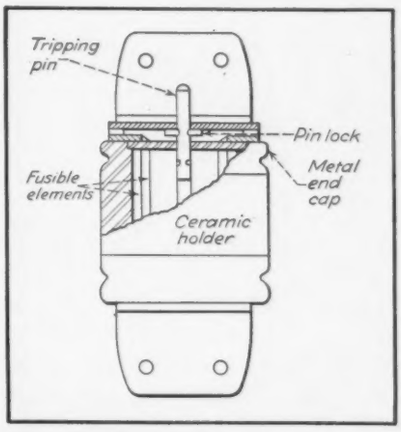
To provide increased bearing in the ground, blocks 4 ft. long and $6\frac{3}{4}$x$8\frac{1}{2}$ in. in cross-section were bolted to the pole butts 2 ft. 9 in. and 7 ft. 3 in. below ground line.

On the H-frame structures outside insulator strings are suspended at the ends of the crossarms.

Industrial Power

Fuse Has Trip-Pin to Open Breaker

To prevent single-phase operation of motors, a fuse with a tripping device has been developed for opening a low-voltage industrial breaker and all lines in the circuit. The arrangement, it is claimed, converts a breaker



SKETCH of fuse with tripping pin in ejected position

of relatively low breaking capacity into one of high breaking capacity. The tripping device is in the form of a pin ejected by chemical action occurring when a heavy current flows due to a short circuit or a line-to-ground fault, according to *The Engineer* (London). The pin not only operates the breaker but also serves as an indicator for the fuse which has blown.

Fusible elements are housed in a ceramic holder which is filled with

powder selected for its arc-extinguishing property. Main current-carrying elements are made of silver, and after they have melted owing to the fault current, the current is transferred to a shunt wire of high-resistance tungsten. A weak fusible section in series with the tungsten wire is connected directly to the tripping pin. When this weak section dissipates the required amount of heat shortly before final clearance of the circuit a chemical charge is ignited below the pin piston and forces the pin outward to trip the breaker.

Travel time for the pin is approximately one-quarter of a second. This short interval insures actual electrical interruption through the tungsten element to have been completed before the pin trips the breaker. According to tests, the pin begins to move in three to five cycles after interruption is complete. A locking catch prevents the pin returning after it has been forced out.

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"Untanking" Tower Handles Transformers

By L. J. POSPISIL
Mechanical Engineer
Washington Water Power Company, Spokane

Substations

To facilitate the handling of three 6,667-kva., 13.8/110-kv. transformers a 42-ft. steel tower was erected by the Washington Water Power Company at its Sunset substation, near Spokane, Wash. It carries and supports hoisting equipment that is used to unload transformers from railroad cars and puts them on a transfer car for positioning in the substation, to lift cores when untanking, and to handle bushings and cover when assembling and disassembling.

The tower, mounted on concrete foundations, is set astride the end of a railroad spur track a short distance from the location of the service transformers. The transformers are also placed alongside the track where they rest on concrete supported rails.

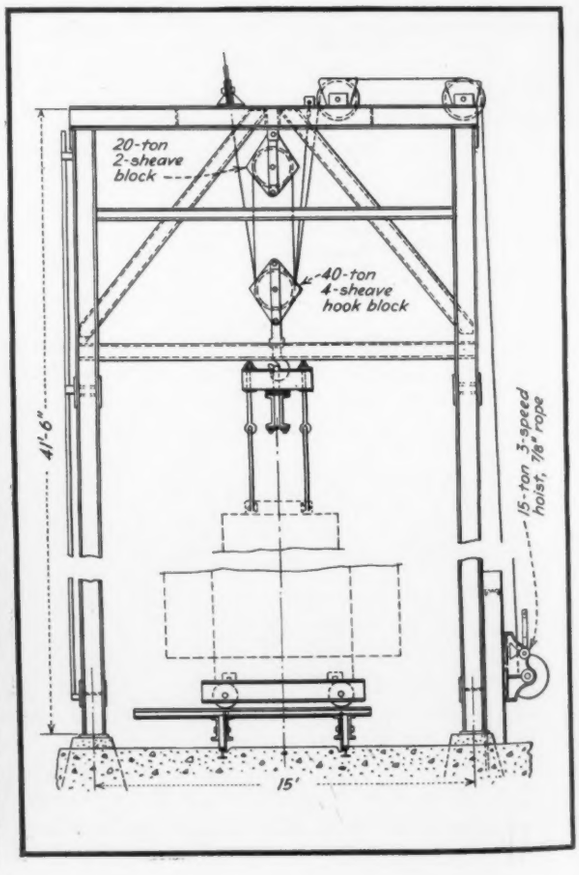
It consists of two A-frames connected at the top by substantial beams and bracing and secured by opposite guys. Each frame is made of 10-in. channel legs connected together with suitable bracing. In the joining of the tower members connections made in the shop were arc welded and those in the field were made by riveting.

While only one line leads to the hoist, the rope is so reeved—as in cranes—that no twist of the hook block takes place, regardless of whether the hook is near its lower or upper limit of travel.

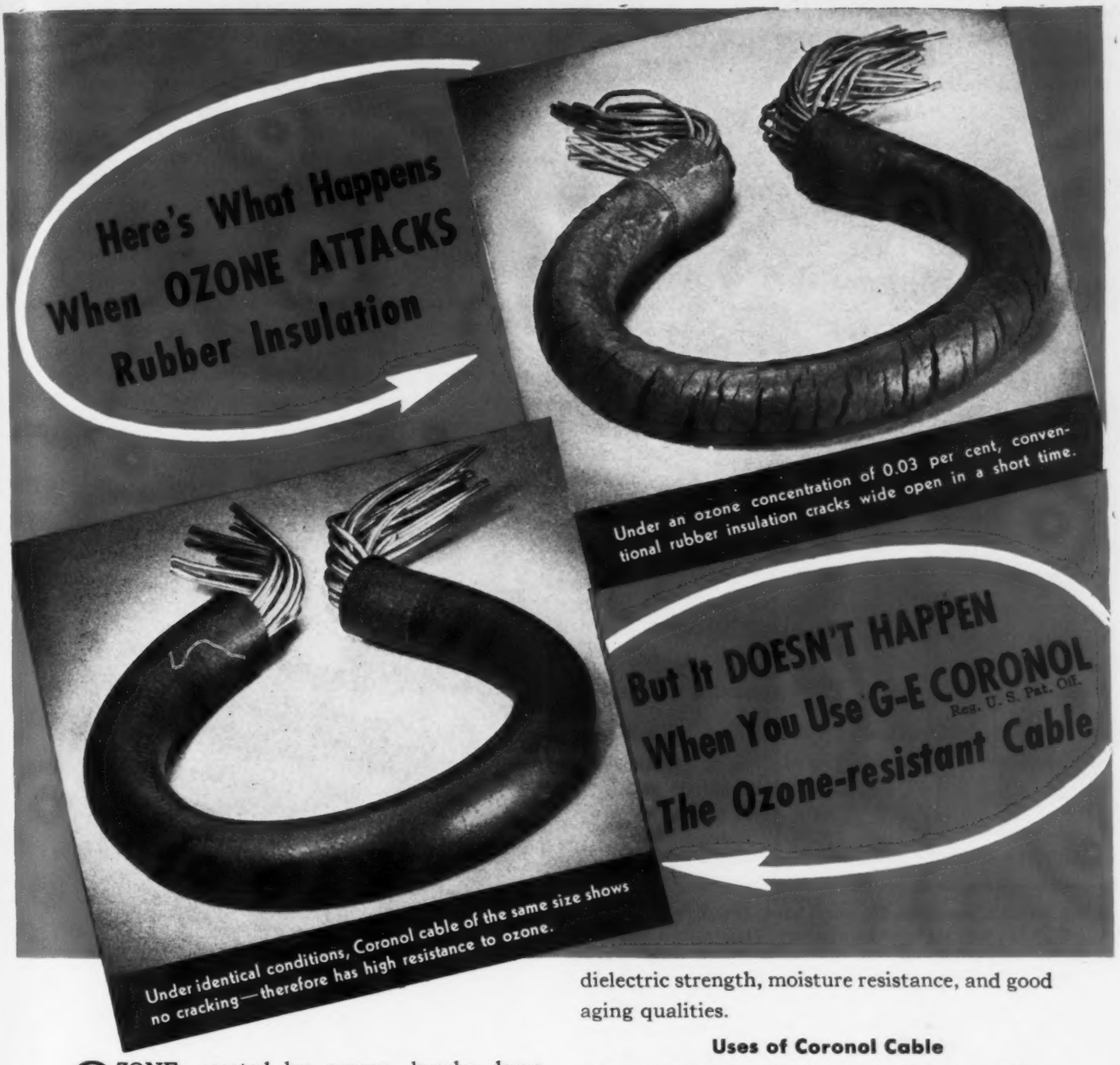
A main beam and two cross-beams with pendant rods are provided to give straight upright pull to the parts being raised or lowered. The seats under the cross-beams have curved surfaces, thus permitting slight rocking of the beams. When the rods are approximately adjusted to a load and lifting is started, the beams have some freedom to "cant" in accordance with the adjustment and pull on the lifting rods connecting to the load.

A manually operated hoist was installed. However, it is also possible to use a large electric drill to operate the hoist in low gear on low and moderate loads, and this has been done.

One of the three transformers is a



"UNTANKING" tower in use (left). Outline of "untanking" tower (right)


Here's What Happens When OZONE ATTACKS Rubber Insulation
Under an ozone concentration of 0.03 per cent, conventional rubber insulation cracks wide open in a short time.
But It DOESN'T HAPPEN When You Use G-E CORONOL
Reg. U. S. Pat. Off.
The Ozone-resistant Cable
Under identical conditions, Coronol cable of the same size shows no cracking—therefore has high resistance to ozone.

OZONE, created by corona, breaks down ordinary rubber compounds. If such compounds were made up for ozone resistance alone, they might well be lacking in the other good qualities that are necessary. Achieving ozone resistance at no sacrifice of strength in other qualities is one of General Electric's accomplishments in the art and science of compounding.

Coronol is an oil-base compound developed by General Electric to provide ozone resistance in *combination* with other good properties such as dielectric strength, moisture resistance, and good aging qualities.

Uses of Coronol Cable

Coronol cable applies in general to the voltage range for rubber-insulated cable. Use it for station, generator, and station auxiliary leads, aerial cable, and nonleaded underground cable. For information on Coronol or any other power and control cables, consult the nearest G-E office, or write General Electric, Schenectady, New York.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

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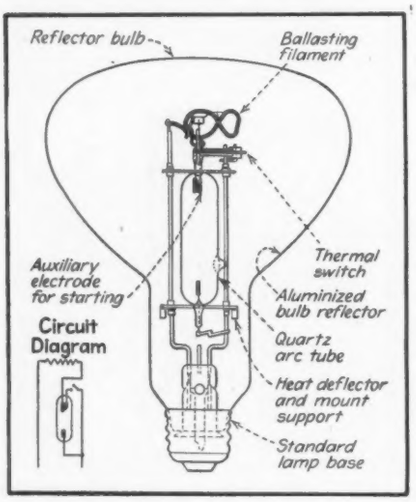
spare that can readily be moved to replace one that has been damaged or needs to be taken out of service for other reasons.

New Development

New Sunlamp Operates Without Auxiliaries

By G. A. FREEMAN
Lamp Division, Westinghouse Electric & Manufacturing Company, Bloomfield, N. J.

Ingenious use of thermostatic metal makes practical a unique and powerful sunlamp that is completely self-contained, requiring no auxiliary transformer or reflector. The ultraviolet output is approximately 500 microwatts per square inch at a 30-in. distance, or about four times the intensity of average summer sunlight. Set 24 to 30 in. away, the lamp will produce skin erythema on the average person with a five-to-ten-minute exposure.



NEW SUNLAMP, consuming 275 watts, has thermal switch which eliminates auxiliary transformer and ballast

In addition to a thorium electrode, there are two new design features: (1) Automatic starting with only 110 to 125 supply voltage and (2) design of the outer bulb which must absorb the harmful bacteriological ultraviolet dangerous to human eyes and yet transmit the beneficial ultraviolet in the adjacent spectral region.

A special glass with a thin wall is used with a bulb that has a hermetically sealed aluminum reflector and is shaped to have good strength. A mercury arc in a quartz tube placed at the focal point of the reflector is the source of ultraviolet radiation. A tungsten filament also contained within the reflector bulb serves to limit the current of the mercury arc, a function usually assumed by an auxiliary transformer or choke coil with other vapor lamps. Infra-red radiation from the auxiliary filament contributes to the total radiation from the lamp, to approximate the quality of sunlight.

When 110 to 125 volts, 50-60 cycle a.c., is applied the thermal switch remains closed for about ten seconds, during which time the ballast filament and the starting electrode in the arc tube heat up. Heat radiated from the filament bends the bimetal, causing the switch to open. The arc tube is then in series with the filament. The starting electrode is hot enough to thermally emit electrons in sufficient quantity for an arc to start in the arc tube. At the time of starting the mercury in the arc tube is mostly liquid, but soon vaporizes from the heat of the arc. After approximately three minutes all the mercury is vaporized, causing 30 psi. mercury pressure in the arc tube. At this pressure the maximum ultraviolet output is obtained. Expected life of 400 applications is based upon the maintenance of ultraviolet intensity rather than actual lamp failure.

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Polarized Control Used on Ski Lift

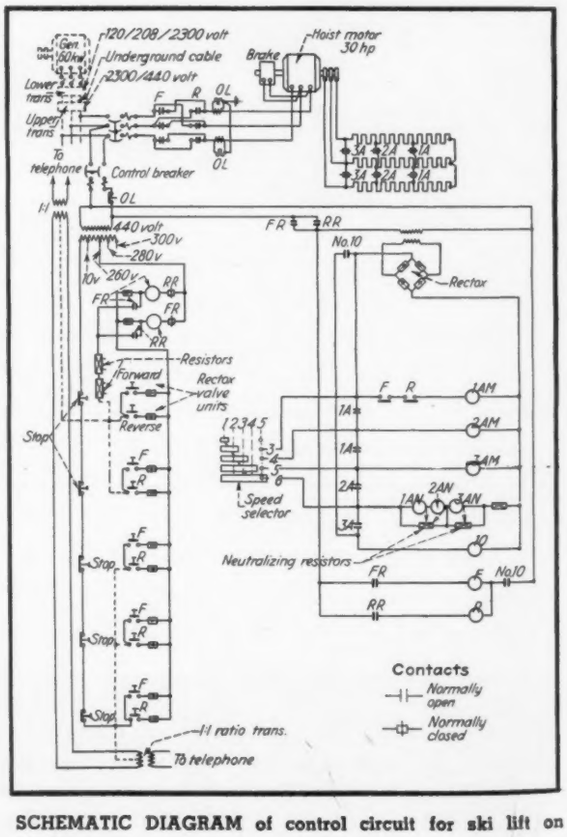
By W. K. NELSON* and R. W. HUTCHINSON†

Industrial Power

For starting, stopping or reversing from anyone of five control points along the line, without the necessity of presetting other control stations, a unique scheme of polarized control is used for the Mt. Hood, Oregon, aerial tramway ski lift. This lift is at Timberline Lodge, is 4,953 ft. long and rises from the 6,000-ft. to the 7,000-ft. elevation. The cable is driven by a 30-hp., 1,750-r.p.m., 440-volt, three phase wound-rotor motor and a 14-r.p.m. gear reducer.

The control scheme utilized originally a ground return circuit which was in addition to the two control wires.

When any forward button is pressed a circuit is completed through forward relay *FR*. Reverse relay *RR* is shut out by the copper-oxide rectifier valves. Relay *FR* seals itself in through the combination telephone and control (phantomed) return circuit and the control wire containing the stop buttons. Relays *FR* and *RR* are electrically interlocked. Closing of



SCHEMATIC DIAGRAM of control circuit for ski lift on Mt. Hood

*Engineer U. S. Forest Service.
†Industrial Division, Westinghouse Electric & Manufacturing Company, Portland, Ore.

General Electric Announces

A NEW* FORM 79 LUMINAIRE

***RETAINS ALL THE FUNDAMENTAL IMPROVEMENTS OF THE PREVIOUS FORM 79 AND, IN ADDITION, OFFERS INCREASED EFFICIENCY**

When aluminum became no longer available as a material for street-lighting luminaires, General Electric was ready with a suitable alternate. Here is the answer, and it meets your most exacting demands—an all-glass luminaire that retains the time-tested fundamental improvements of the Form 79, and at the same time boosts efficiency more than 10 per cent. General Electric, Schenectady, N. Y.

AIRPLANES are getting the aluminum, but Novalux Form 79 luminaires still have the fundamental improvements that seven years of service have proved outstandingly successful.

FORM 79 LUMINAIRES ARE FAMOUS FOR THEIR EFFICIENT, EFFECTIVE LIGHT CONTROL. Now silvered glass has replaced aluminum in the optical design. You not only get the same light distribution as before but, in addition, a 10-per-cent increase in light output.

FORM 79 LUMINAIRES ARE FAMOUS FOR THEIR EASY ADAPTABILITY TO EVERY PRACTICAL REQUIREMENT OF MOUNTING AND WIRING. Hoods—now of cast iron—are available in all previous designs.

FORM 79 LUMINAIRES ARE NOTED FOR STAYING CLEAN AND DRY INSIDE. Globes and reflectors are still factory-sealed to exclude insects, dust, and moisture. The joint that is opened for relamping is kept tight, not by the use of gaskets but because an accurately machined hood fits against a die-formed reflector collar.

FORM 79 LUMINAIRES HAVE SAVED USERS THOUSANDS OF DOLLARS IN GLASSWARE MAINTENANCE COSTS by spun-sealing—for protection of the globe rim during installation and servicing. The joining of glass reflectors to the globes is still done to retain this benefit.

FORM 79 LUMINAIRES HAVE ALWAYS BEEN A GOOD INVESTMENT. The construction was, and still is, simple. The materials and methods used have proved their serviceability. The new Form 79 can be depended upon for years of efficient, satisfactory service.

The new design uses materials that are least needed in the manufacture of military equipment; but skilled adaptation to proved principles of construction makes them fully practical. When you use Form 79 luminaires for traffic-safety or protective lighting, you obtain a most effective job.

A G-E lighting specialist will gladly show you more of the easy-to-live-with features of the new Form 79 luminaire. A letter or call from you is all it takes.

GENERAL ELECTRIC

452-23-3010

relay *FR* energizes the rectifier supplying direct current to the main and neutralizing coils of the accelerating relays, 1-A, 2-A and 3-A, and also selects main contactor *F*.

Functioning of the accelerating relays, with predetermined time delay regulated by the neutralizing coils and resistors, brings the motor to full speed gradually by cutting out the secondary resistor. The speed selector switch can be set to limit the speed to which the motor can accelerate. This switch is located at the main control station at the upper terminal of the ski lift. Pressing any stop button breaks the circuit to relay *FR*, thus de-energizing the main control circuit and opening the primary circuit to the motor.

With the lift stopped when any reverse button is depressed, relay *RR* is selected by the Rectox. This relay starts accelerating sequence and selects the main reversing contactor *R*, which, when closed, causes the motor to operate in the reverse direction.

Return Circuit

While using the ground return originally installed, sometimes erratic operation was caused when a stop button was pressed. It was deemed advisable to use a full metallic return circuit on the control, so the two telephone wires were phantomed as indicated by dotted lines on the diagram. All of the grounds were then removed. Operation has been satisfactory since the change was made.

Provision was made for an additional accelerating point, if necessary to prevent jerking of the cable and swinging of the suspended chairs by too rapid acceleration. Operating experience has indicated that four accelerating points are satisfactory. No swinging is noticed from rapid starting.

A thrustor type brake is used on the resistor, to provide smooth braking and prevent undue strain on the drive mechanism. For safety consideration an emergency hand-operated brake is provided on the rim of the main cable drive sheave.

During summer operation there are times when the entire load is a descending one. It was thought that under this condition the driving motor might tend to overspeed. Provision was made for the addition of an auxiliary loading governor to energize a contactor, which, in turn, would connect a resistor across the motor primary to dissipate regenerated power and prevent overspeed of the drive engine at the power plant. Operating experience shows that the overspeed control is not needed.

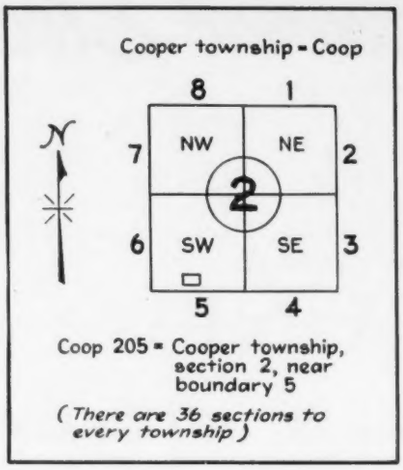
New Development

Codes Speed Rural Trouble Shooting

As a rule, more than 90 percent of the time to restore service in rural areas is spent in locating the farm customer in trouble and getting on the job. Once on location, repair usually is a matter of minutes.

Two somewhat similar methods, that make use of political subdivisions—townships and sections—have been used successfully in Iowa by Fort Dodge Gas & Electric Company and Peoples Gas & Electric Company of Kansas City. They were reported by Willis H. Hogan and Mark Harpster, respectively, at an Iowa Utilities Association symposium on the subject.

Fort Dodge Method—Each of the 36-mile-square sections of the townships served by this company are numbered serially from 1 to 36. Also, considering each section to be divided into quarter sections, the two external boundaries of the corresponding quarters in every section are numbered the same, from one to eight, progressing clockwise around the section as shown in the sketch. Farmhouses of customers living in each quarter section are usually near one of the roads bounding section. Thus, by assigning each customer a code word and number that identifies the township, the section number and the external quarter section boundary nearest his home, service men can promptly reach trouble points. Thus, farmer Brown—identified in customers' accounts and on system maps as Coop 205—would be in Cooper township and in the southwest section near the southern boundary of that section. To be sure, the customer always knows his code identification and uses it in all dealings with the company; plastic disks like the one illustrated are distributed for attachment to his telephone mouthpiece. The identification also appears on all bills.



KEY to interpretation of code number is found in abbreviation of township, number of section and number of section boundary nearest residence

Coop 205 is Cooper Township, section 2 near southern boundary SW quarter. All section boundaries are numbered the same.

PLASTIC DISK for customers' telephone carries code number indicating location of residence by township, section and quarter section. Customer gives code number in reporting service outage

Peoples Gas Method—A coordinated map and customer listing system is used by this company to locate farm customers. When a trouble call is received from a customer his name is located in an alphabetical listing which gives the location of his farm by township, section number and quarter section. The list also gives a letter-number designation which corresponds with a similar letter-number on the system map at the point where his farm is located. Thus, with the township, section and quarter section given by the list the location of the customer's house in the quarter section can be quickly found by the code number on the map.

The FIRST Time It Operates

IT'S PAID FOR

YOU'LL HAVE FEWER OUTAGES WITH THIS RECLOSING CUTOUT

It recloses in one second—and *more than pays for itself* by saving:

1. An extra trip with the service truck
2. Loss of revenue
3. Loss of customer good-will

And it goes on paying similar dividends with every operation.

You save an additional amount if you're already using G-E *indicating* cutouts, because you can convert to *reclosing* cutouts by simply installing two-element doors—usually without affecting your co-ordination set-up. The doors contain complete reclosing mechanisms and fit the housings of both the 5- and 7.5-kv cutouts—and the changeover takes only a minute.

Look into the economies of G-E reclosing cutouts. They offer double savings on lines serving important customers or out-of-the-way areas—and they're economically justified for sectionalizing wherever temporary faults exceed 20 per cent of the total.

. . . FORMULA FOR CUTOUT FLEXIBILITY

The G-E reclosing door is one of the five standard items in the G-E Formula for Cutout Flexibility. Two others are the single-element door and the disconnect door All three doors fit the housings of both the 50-amp, 5-kv cutout and 7.5-kv cutout . Here's maximum flexibility, interchangeability, standardization. Here are two housings and three doors—*five items in all*—to fill 80 per cent of all distribution fuse cutout needs. A similar 2-housing 3-door combination in the 100-amp rating is available for the other 20 per cent. Complete cutouts and separate doors are stocked for quick deliveries.

Write for Bulletin GEA-3448. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

Steam Plant

Motor-Turning Gear for Small Turbines

For economic reasons, motor-driven turning gears, rather than steam-idling nozzles, were chosen for three General Electric mechanical-drive turbines to be installed at the Sherman Creek generating station of the Consolidated Edison Co. of New York. This is said to be the first application to auxiliary turbines.

The turbines, each rated approximately 1,700 hp. at 4,400 r.p.m., are of the condensing automatic-extraction type. Any one of the three units may be used as the spare, and when serving as standby, or spare, the turning rotor will be kept in motion to insure uniform temperature of all rotating parts. The turning device is designed to keep the unit turning at about 13 r.p.m. By this procedure the extended warming-up period in starting is eliminated and the turbine may be placed in service at normal speed and load immediately upon demand.

An inclosed worm-gear drive is mounted on the extension of the turbine shaft at the high-pressure end and is arranged to engage the turbine shaft through a spiral jaw coupling. This coupling is manually engaged by means of a lever, but is automatically disengaged whenever the turbine speed tends to increase beyond the speed at which the driving half of the spiral jaw coupling is rotating. The coupling stays out of engagement due to a positive weight loading until such time as it is manually re-engaged.

The driving motor of these turning devices is rated 2 hp., 900 r.p.m., and is connected to one end of the worm gear. An oil pump for supplying oil for bearing lubrication is attached to the other end of the worm gear and driven by the same motor.

Meters

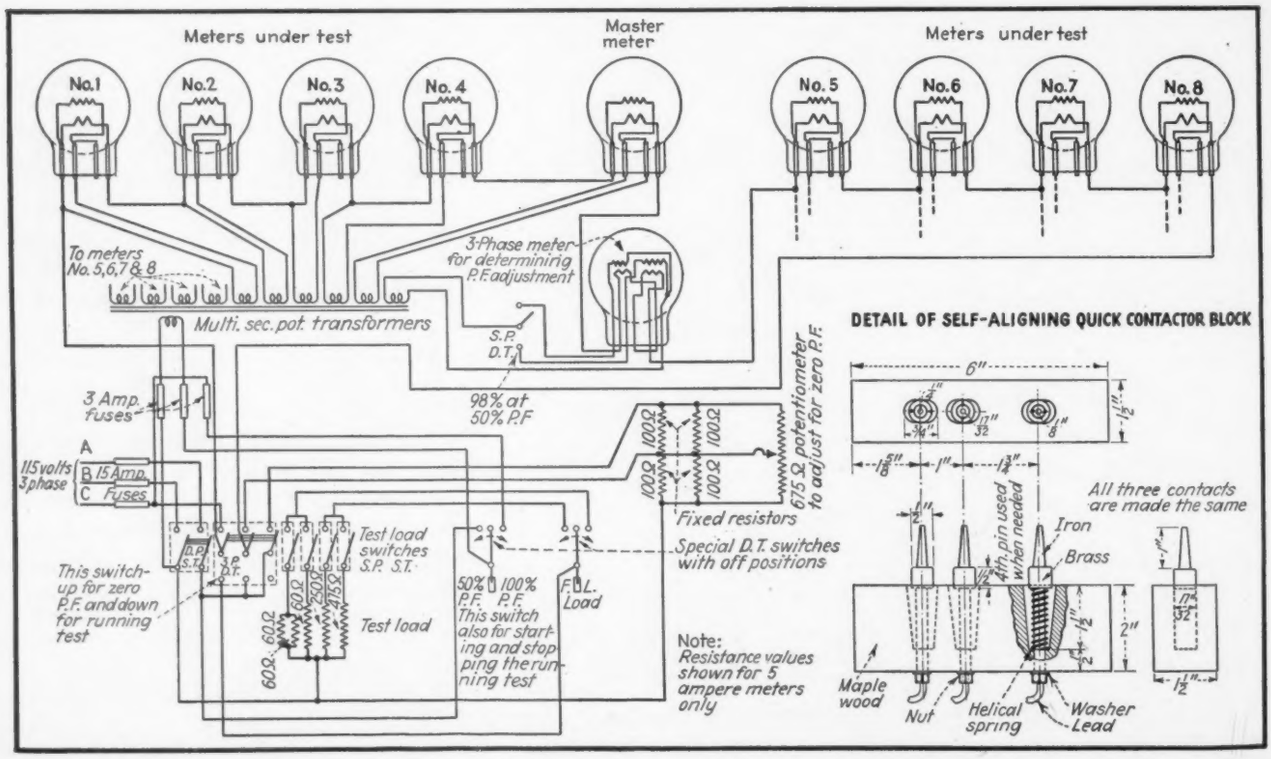
Gang Test Board Has Novel Features

By H. A. TOWER
Meter Shop Foreman
Central Illinois Public Service Company, Springfield

The Central Illinois Public Service Company is using eight-meter gang test tables with two seemingly unusual features. The first is a spring pin contactor designed to have lateral as well as the conventional vertical mobility, which, with a two-position stop block to serve as the top support, makes it possible to connect readily any of the four terminal meters now found in service without the use of so much as a screwdriver. The lateral flexibility in this contactor is obtained by using an elliptical rather than a round pinhole in the contactor spacer block. The two positions on the stop block are obtained by fastening it to the test board with a bolt and lock washer, giving it a friction fit. This makes it possible to turn the stop block to either position by a half turn with the hand.

The second feature is an adaptation of the zero power factor method of testing. A two-element polyphase meter is used. One element is calibrated 100 percent at zero power factor, the other is calibrated 98 percent at 50 percent power factor. The current passes through both current elements at all times. The potential circuits are changed by a toggle switch.

Repaired meters having lag adjustments are calibrated by the zero method on the 100 percent element, but those needing no adjustment, or having non-adjustable lag plates, are checked by the 98 percent element, using the "no creep" method. Those meters which do not creep, or which creep forward, are within the 98 per-



SCHEMATIC DIAGRAM and switching arrangement for eight-meter gang test table. Inset shows arrangement of spring pin contactor

COMPLETE EASY TO SELECT EASY TO INSTALL

FH CUBICLES
WITH
AIR-BLAST BREAKERS
IN ONE
COMPACT FACTORY-BUILT ASSEMBLY which
SIMPLIFIES station design by co-ordinating all necessary equipment in easy-to-select "packages"
SAVES time, space, and money, because it is complete and of unit construction
AND IS SHIPPED ready for quick, easy installation at a predictable cost

FOR POWER STATION SERVICE

UP TO 23,000 VOLTS AND 2,500,000 KVA

GENERAL ELECTRIC

cent limits. A stop was placed on the polyphase meter to keep the disk near the no creep position.

To date these boards have been built only for single-phase, two-wire meters.

Lighting

Emergency Lighting for Line Repair Jobs

In designing emergency lighting equipment for line repair work, Florida Power Corp. sought to make it as simple as possible and to so arrange it that it could be set up within a few minutes. Attention was also paid to the fact that it would sometimes have to be set up in the dark, during rain.

The floodlight equipment finally devised by W. L. Pilsbury can be put into use within fifteen minutes after the crew arrives at the job, provides a tremendous improvement over flashlights and an added factor of safety for the men and speeds repair work.

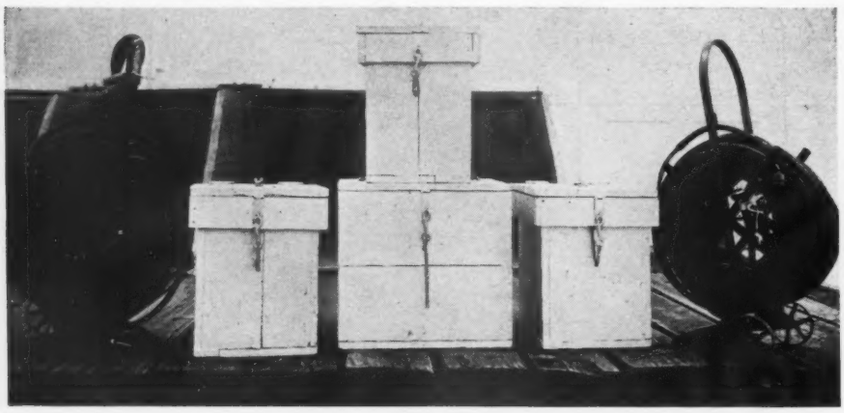
Four flexibly mounted floodlights, each with a 300-watt bulb, make up the lighting equipment. The boxes on which the lamps are mounted serve also for carrying; rope handles on the backs facilitate handling. Harness snaps on the boxes make it easy to remove the floodlights and fasten them to the mounting bases on the covers.

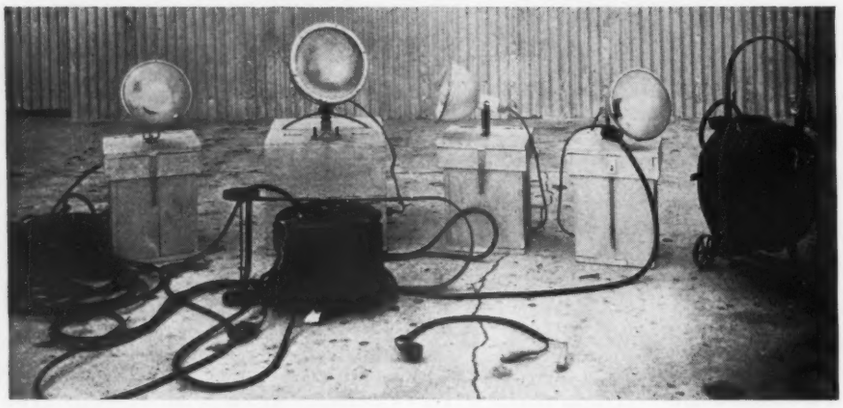
Two Reels Used

Two 200-ft. reels of No. 14 two-wire type S 600-volt rubber-covered cable are used; one is fitted with weatherproof sockets so arranged that the floodlights can be plugged in every 5 ft.; the other is used, if necessary, to reach the voltage supply source. There is also a 2-ft. extension cord of the same type of wire which has two battery clips on one end and a weatherproof socket on the other.

At the job the floodlights are set up and plugged into their respective sockets. The insulated 2-ft. cord with the socket on one end and the two battery clips on the other is attached to the secondary wire (source of electricity) by simply tying it around one of the secondary wires to keep it from falling to the ground. The two battery clips are then clipped on the "hot" secondary, making the socket hot, ready for use. The long extension wire to the floodlights is then tied around the secondary the same way and plugged into the hot socket. The 2-ft. and the long extension wires are tied around the secondary wire so that the weight of the long wire will not pull the battery clips off or pull apart the plug to the socket.

The regular way to make the connection would be to tie it securely, then use connectors. This takes too much time and connectors would be needed as well as a wrench to tie them with. Since the 2-ft. wire and the extension cord are both insulated, they can be tied around the secondary (bare or insulated) in a loose knot very quickly.





FLOODLIGHTS, mounted in convenient carrying boxes, make up emergency lighting system for line repair work. Top view shows them ready to be taken to the job; lower view shows them set up ready for use. Each unit uses a 300-watt bulb; the second floodlight from the left was in stock; the three others are S & M No. 803 "Rep Cap" and cost approximately $6 apiece

Industrial Power

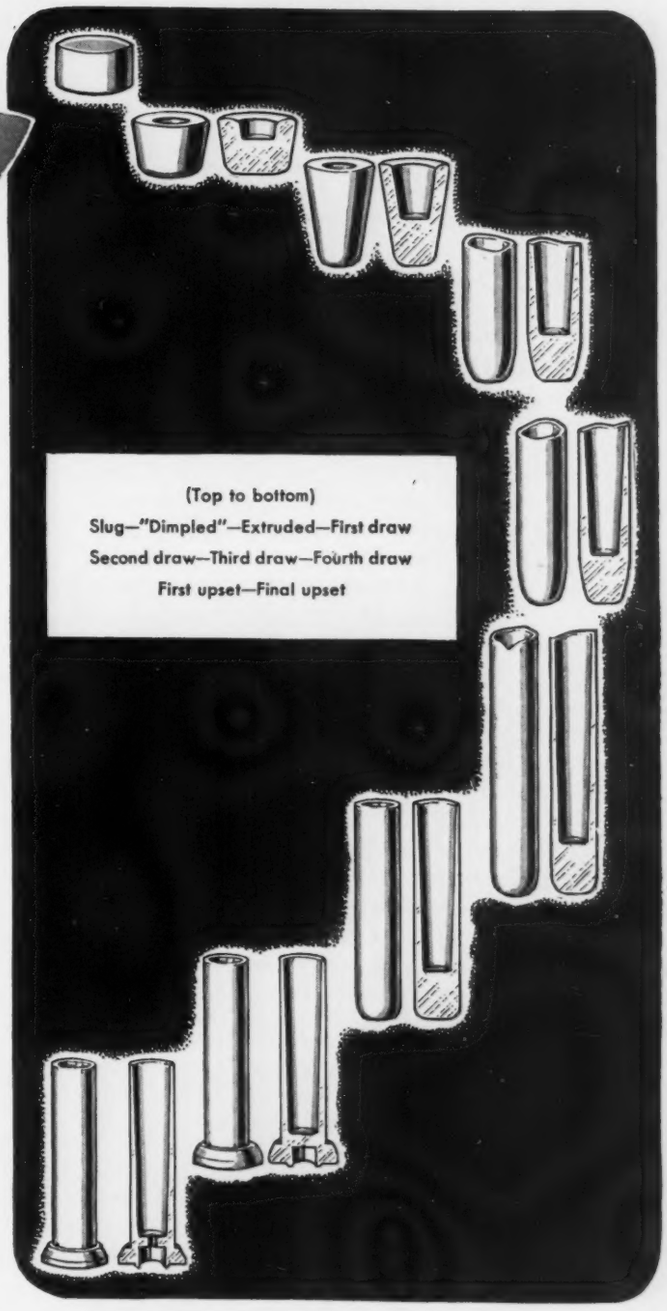
Power Supply for Supercharger Plant

Primary power is supplied to the new supercharger plant of the McCulloch Engineering Corporation plant at Milwaukee over a single 26.4-kv. line. At the plant's outdoor substation (shown) it is stepped down in a 300-kva., three-phase power transformer to 220 volts, three phase, three wire for distribution throughout the plant. The plant lighting system—110/220 volts, single phase—is supplied by a separate single-phase, 75-kva. transformer.

Secondary output of the main power transformer is led into the plant through three parallel runs of 500,000-cir.mil cable in separate ducts to the 1,200-amp. main secondary air circuit breaker and distributed throughout the plant by a 170-ft. run of 1,000-amp. metal bus duct.

Total plant connected load is ap-

From "vanities" to primer bodies...



when Volupte and Revere put their heads together

When Volupte, Inc., one of the leading manufacturers of compacts, wanted to use its facilities to make primer bodies for Uncle Sam, the change-over involved more than merely a shift from beauty to utility.

Everything was new. Appearance had once been vitally important. Now performance took its place. Emphasis on surface finish gave way to emphasis on ductility, uniformity, precision. The brass had to be of a new analysis, responding differently to the various operations. New equipment had to be selected, and new methods worked out.

Here was a situation full of potential "headaches" for the manufacturer, but also full of opportunity for a Revere Technical Advisor to assist in eliminating them. After calculating a temper for the brass providing the correct balance between ductility and machinability, the customer was provided with a specification which made it easy to specify materials on repeat orders. A correct method was developed for each new operation. Recommendations on sizes of stock were made, to minimize scrap loss.

Quite some time has passed since Volupte, Inc. worked out these problems with the Revere Technical Advisor. America now has a large new source of dependable primer bodies . . . a prominent manufacturer has successfully added a new type of business . . . and Revere has helped an old friend. The Revere Technical Advisors will be glad to help you with your problems. Write us.

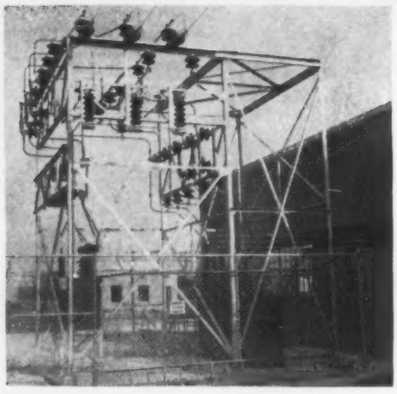
REVERE

COPPER AND BRASS INCORPORATED

Executive Offices: 230 Park Avenue, New York

Sales Offices and Distributors in most of America's major cities

MILLS: BALTIMORE, MD. · TAUNTON, MASS. · NEW BEDFORD, MASS. · ROME, N.Y. · DETROIT, MICH. · CHICAGO, ILL.

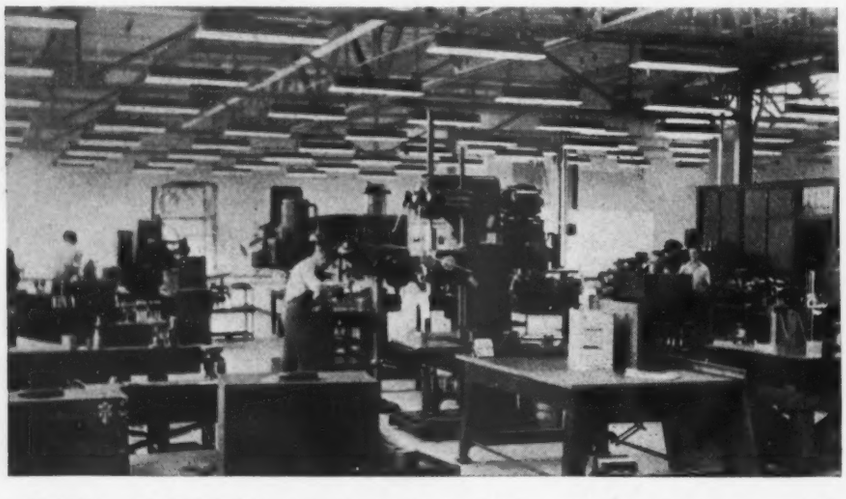


COMPACT substation houses 375 kva. in power and lighting transformers to supply Milwaukee supercharger plant

proximately 1,400 amp., mostly motors with normal full load around 700 amp. In designing the substation the transformer size was selected with the view to loading the transformer to near full rated load for reasons of economy. Ample copper was used in the plant radial distribution system, however, the general design theory being that it is cheaper to change a main transformer for a larger one as load grows than to replace copper inside the plant. Using a 1,000-amp. main feeder and a minimum wire size of No. 12 voltage drop in the plant system is limited to around 8 volts from the transformer to the most remote machine, it is said.

Individual machine lighting within the plant is at 110 volts, but all fluorescent lights are supplied at 220 volts to minimize the effect of voltage dips upon fluorescent lamp operation.

An illumination intensity of approximately 27 ft.-candles is obtained in the machine shop with three 48-in., 40-watt white (2,100 deg.) lamps mounted in trough type fixtures mounted 13 ft. 6 in. from the floor and on 8-ft. 4-in. x 12-ft. 6-in. spacing. There is a total of 168 such units in the machine bays. Over the production office space and inspection area 30 more units are used with two 40-watt white lamps per fixture mounted 13 ft. 6 in. from the floor, but on 8-ft. 4-in. x 8-ft. 4-in. spacing to give approximately the same illumination intensity.



GENERAL ILLUMINATION of 27 ft.-candles is supplemented by individual machine lights using three 40-watt lamps in trough-type units

• • •

Advantage of Having Circuits Grounded

By H. A. PETERSON
Central Station Engineering Department,
General Electric Company, Schenectady, N. Y.

Line Engineering

Results of numerous technical investigations, field tests, broad experience and theoretical considerations have been the basis for several good engineering reasons for grounding distribution or other low-voltage circuits. The reasons are as follows:

1. Switching surges are generally from 50 to 75 percent more severe in isolated neutral than in solidly grounded circuits. This is an especially important consideration when switching is done frequently, such as in industrial plants or steel mills, where motors may be started and stopped relatively often, or when switching is done at the terminals of generators operating with neutral isolated.

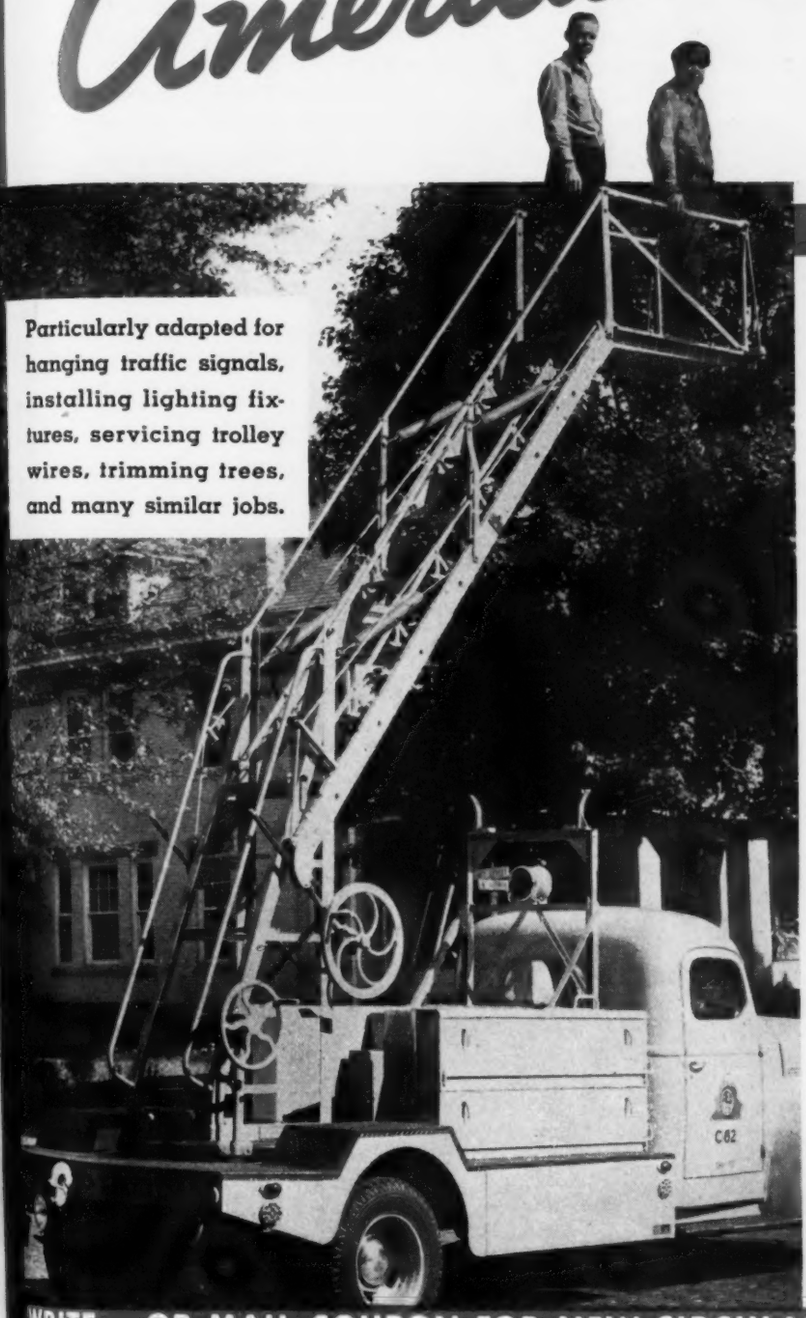
2. Overvoltage resulting from blown sectionalizing or transformer fuses in combination with faults may occur in many of the isolated neutral circuits as now operated. It is believed that this fact, and the severity of switching surges (item 1) account for most of the overvoltage difficulty experienced in isolated neutral systems, rather than the arcing ground which has been blamed for many difficulties in the past without adequate substantiating evidence.

3. In view of these facts, there is a logical argument for equipping isolated neutral systems with overvoltage protective equipment even in systems which are not exposed to lightning disturbances. Such procedure is more on the order of a pound of cure rather than an ounce of prevention, however, since overvoltages other than those caused by lightning can be avoided to a large extent by solidly grounding the system neutrals.

4. In any system properly equipped with overvoltage protection, it is logical to assume that voltages arising from any cause, whether it be lightning, switching, or other, will be limited to safe values. However, there is a substantial difference in the voltage protective level that can be held by arresters in an isolated system as compared with that which can be held in a solidly grounded system. Arresters for use in isolated neutral systems must have full line-to-line voltage rating plus a suitable margin which will prevent the possibility of exceeding the arrester rating under line-to-ground fault conditions, while arresters for use in solidly grounded systems can have a substantially lower voltage rating. For this reason the portective level in the isolated neutral system is from 10 to 25 percent higher than in the solidly grounded system.

In general, no distinction is made for equipment as to whether it is to be used on an isolated neutral or a solidly grounded system. Therefore, since all insulation life is a function of voltage and time, other things being equal, there is a logical argument for grounding even though arrester protection is provided.

NOW it's the *American-Seagrave* Aerial Platform LADDER



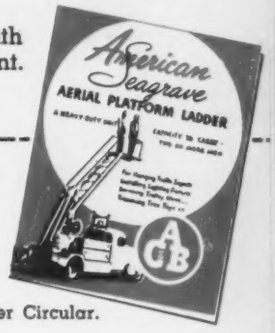
Particularly adapted for hanging traffic signals, installing lighting fixtures, servicing trolley wires, trimming trees, and many similar jobs.

AMERICAN COACH & BODY CO. Acquires this Famous Heavy-Duty Two-Man Ladder

In line with its policy to supply utilities with everything required and all that is best in equipment for motor vehicles, American has acquired the manufacturing and selling rights for the Seagrave Aerial Platform Ladder.

Note these pronounced advantages.

- Roomy platform allows two or more men to work efficiently and safely.
- Perfectly safe for the heaviest job in any position.
- Platform can be elevated 65 degrees to enable men to work at height of 23 ft. 10 in., or extend to handle job 12 ft. 8 in. from side of truck; turntable swings complete 360 degrees.
- Steps 8" wide (not rungs) are always horizontal at any elevation.
- Guard rails 28" high on both sides of ladder and around platform afford full protection.
- Reaches easily over parked cars to lights on curb.
- Ladder may be mounted with body to meet any requirement.



WRITE...OR MAIL COUPON FOR NEW CIRCULAR

From 0° to 65° Elevation in 40 Seconds with Hydraulic Power

A New Improvement by American

Operation is speeded, labor greatly reduced by this mechanism just made available by American engineers. Hydraulic hoist takes its power from pump take-off mounted on side of the truck transmission. Optional at extra cost in place of standard handwheel elevating mechanism.

THE AMERICAN COACH & BODY CO.
Woodland Ave. at E. 93rd St.
Cleveland, Ohio

Send me new American-Seagrave Aerial Platform Ladder Circular.

Name .....

Position .....

Company .....

Street .....

City ..... *State* .....

Accuracy Increased by Color Contrast

Data obtained from a series of tests establish the fact that a suitable attention to color contrasts and brightness is essential if the best results are to be secured from any lighting system. Although the data are far from complete, field investigations are being continued.

Conclusions, as made from the accompanying table, would seem to indicate that light buff is the most suitable color where the material under fabrication is iron or steel, with light gray a close second. From a psychological angle, light blue offers possibilities which should not be overlooked.

When the figures were laid before the supervisory force for criticism, the main comments were that while from a theoretical standpoint the idea was good from the purely maintenance angle it was not practical to paint machines such a radical color as light buff. As a compromise, all machines were painted a medium gray with light buff around the working area. The purpose was to utilize the luminous possibilities of the lighter finish and still satisfy maintenance requirements. Surprisingly, the combination seemed to perform better than any of the solid colors.

Certain facts are evident: (1) soft contrasts are easier on the eyes than abrupt changes in brightness; (2) making the tool area slightly lighter does tend to concentrate the attention on the work; (3) a favorite contrast does highlight danger.

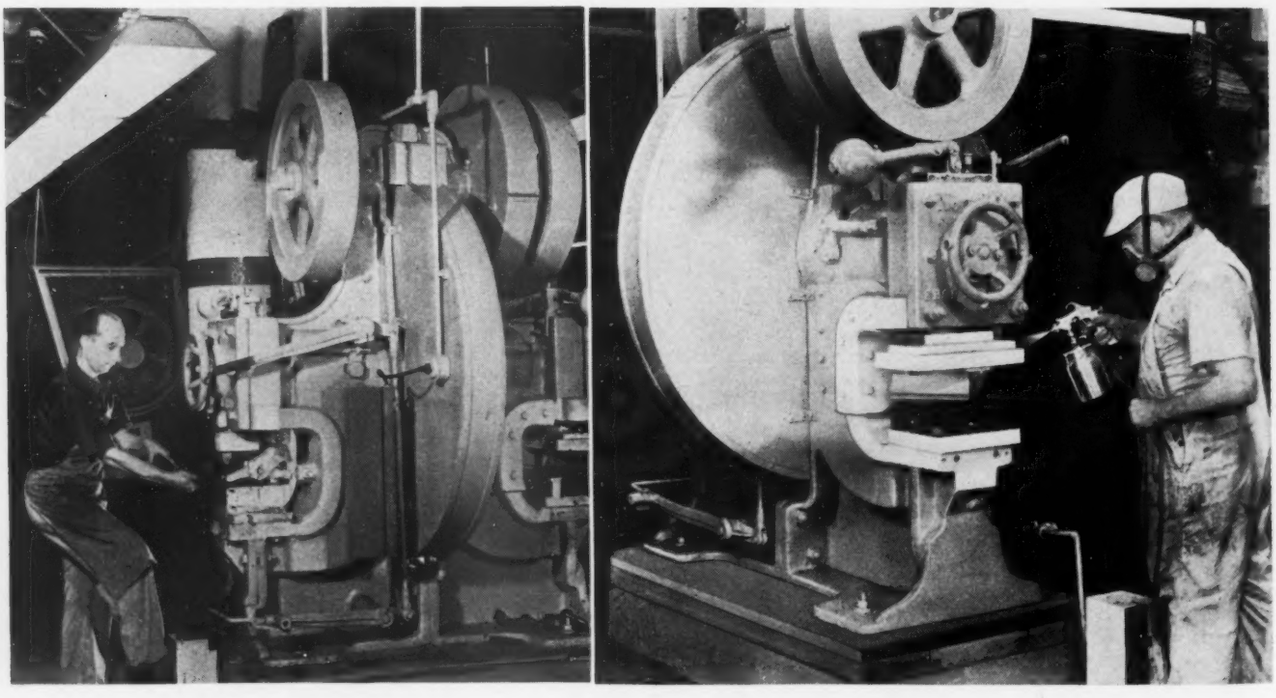
The most significant feature is the three-dimensional effect secured by

* Excerpt from "Improved Vision In Machine Tool Operators by Color Contrast," by Arthur A. Brainerd, Philadelphia Electric Company, and Matt. Denning, E. I. duPont de Nemours & Co., recently presented before the Illuminating Engineering Society at Atlanta, Ga.

Composite Rating

Color of Paint	Percent Rating—Mercury Light					Percent Rating—Incandescent Light				
	Time Study	Reflected Light	Questionnaire	Average	Final Rating	Time Study	Reflected Light	Questionnaire	Average	Final Rating
Punch Press										
Yellow		92.3	8.7	50.0	51.1		64.6	10.7	37.7	37.7
Light blue		79.3	31.2	55.3	56.0		88.0	61.6	74.8	74.8
Light buff		97.5	100.0	98.8	100.0		100.0	100.0	100.0	100.0
Medium gray and light gray		100.0	43.7	71.9	72.6		93.7	53.9	73.8	73.8
Shear										
Light buff	100.0	100.0	100.0	100.0	100.0	100.0	92.9	100.0	97.6	100.0
Aluminum	67.1	8.44	100.0	85.2	85.2	69.1	78.6	100.0	82.6	84.6
Light green	95 5	64.8	18.2	59.5	59.5	85.5	77.7	19.6	60.9	62.4
Light gray	97.2	87.5	54.0	79.6	79.6	82.8	96.5	97.6	92.3	95.6
Dark green and Light gray	88.5	91.1	18.5	66.0	66.0	75.8	100.0	23.3	66.4	68.0

The percent ratings for time study, reflected light and the questionnaire are from assembled data. These three ratings are averaged for each color as shown in the average column. The color having the highest average rating is then assigned a final rating for 100 percent, the other colors in each group being rated as percentages of this value.



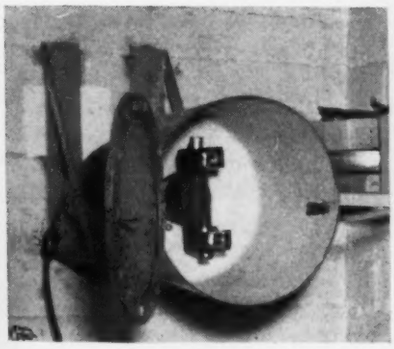
THIS PUNCH PRESS in its original dark gray was so near the color of the metal undergoing fabrication that it was difficult for operators' eyes to separate the danger point from other machine areas (left). After painting this punch press to remove the camouflage caused by solid, drab colors, the working area was "spotlighted," reducing eye fatigue and increasing operating efficiency, because the work in production stood out in steroscopic sharpness

controlled color contrasts. The work in machines so treated stands out in stereoscopic clearness that cannot be achieved with brightness contrasts alone.

Since colors are not truly represented under different types of light sources, both incandescent and mercury lighting equipment was installed for the machines. Mercury light was provided by a 450-watt, low-pressure mercury tube suspended over each machine. Incandescent light for the shear was supplied by a 500-watt, silvered-bowl lamp in a diffuser. Four 200-watt, clear lamps in angle reflectors constituted the source of incandescent illumination for the punch press. As far as possible, illumination in the working area was maintained at 30 footcandles.

Meters

Devise Centrifuge for Clock Rotors



For expelling oil and cleaning fluid from telechron clock rotors an ingenious motor-driven centrifuge has been devised at the meter shop of the Wisconsin Public Service Corporation, Green Bay, that consists simply of a fractional-horsepower, 1,800-r.p.m. repulsion-induction motor with a strap-iron clamp for holding the clock rotors attached to its shaft. This rotating element is inclosed within a cut-down spinner vessel of the type used on household washing machines which for safety is provided with a wire screen door.

Clock rotors, formerly allowed to drain by gravity, are centrifuged in a matter of seconds with this device, which was assembled from available spare parts at very nominal cost.

PIONEER OF THE CEDAR INDUSTRY

BUILT THE FIRST BUTT TREATING UNIT IN 1907

PIONEERED CUSHION MACHINE INCISION

FIRST WITH THE CONCAVE GAIN

FIRST WITH THE SLAB GAIN

FIRST TO OFFER THE "FINISHED CEDAR POLE"

MACHINE SHAVED
Capacity — Two Cars per day

designed pole shaving machine gives the user the first machine shaved Cedar with sapwood reduced to ½" minus for extended service life above ground.

DURAPOLE
FULL LENGTH CREOSOTE TREATED
Capacity — One Carload per day

designed full length creosote treating tank for full length submersion treatment in heated creosote, with properly maintained temperatures.

10' wide 6' deep 105' long

designed their shaving machine to reduce the sapwood to ½" or less on the entire above ground pole section, regardless of sapwood thickness of the rough pole. To eliminate saprot this sapwood thickness must be within this non-moisture retaining ½" limit. All under surface hidden defects are exposed in thus removing the outer surface, on DURAPOLE.

To further improve the above ground section of the Cedar pole, DURAPOLE offers full length short time hot, or long time hot and cold submersion treatment in AWPA grade one creosote. designed and built their treating plants to maintain constant temperature not only in storage but also in the treating vats. All storage tanks and treating vats are heavily insulated, with steam coils as an integral part of their construction. Creosote introduced at the required temperature is kept at this temperature regardless of atmospheric temperature or the length of treating cycle; each treatment is checked and recorded as to time and temperatures by locked automatic recording thermometers. Bolt holes and season checks are thoroughly treated.

DURAPOLE also has machine incised, ½" guaranteed penetration creosote butt treatment.

DURAPOLE offers continuous slab gaining, at the users' option.

For longer pole life, in storage and in line; for much improved appearance; for ease and low cost maintenance and handling —

ESTABLISHED 1892

VALENTINE CLARK CORPORATION

2516 DOSWELL AVE. . . . ST. PAUL, MINN.

YARDS AND TREATING PLANTS
Minnesota Transfer, Newport, Washington
Lumby, B. C.
Hibbing, Minn.

BRANCH OFFICES
84 William St., New York, N. Y.
Dwight Bldg., Kansas City, Mo.

Wichita Reports on Radio Crew Direction

By H. E. MARGRAVE*
Chief System Operator
Kansas Gas & Electric Company, Wichita

With flour mills, grain elevators, oil refineries and five airplane factories scattered through 28 towns in a 35x65-mile service area of Kansas Gas & Electric Company short-wave radio crew dispatching has brought a definite improvement in handling emergencies jeopardizing life and property. Experience with the system shows for an average six-month period: (1) An average time to contact one-way car after call, 2.92 minutes; (2) one-way contact efficiency, 88.1 percent; (3) two-way contact efficiency, 99.2 percent.

Starting in 1939 with a 200-watt station operating at 31,460 kc., the company's equipment now comprises six mobile receivers and two mobile transmitters and covers the Wichita division area. Contemplated addition of automatic repeater stations is expected to double the range of mobile transmitters.

Laid out using an antenna support height of 150 ft. for the station's antenna and using a 200-watt transmitter, the system represents an economical compromise between signal strength at the outer edge of the Wichita service area and cost of transmitting apparatus.

The antenna mast of unguyed tubular steel was designed by company engineers and supports a closed J-type antenna. Mast design called for a taper beginning with 12 in. at the base and reducing to 2½ in. The mast, fitted into a vertical groove in a concrete base, is held by 1¼-in. U-bolts. There are two objections to an antenna of this type: (1) It has to be lowered for inspection, and (2) there is no convenient way to mount obstruction lights. The FCC and the Bureau of Aeronautics issued a waiver on lighting the mast, however. A second emergency standby antenna of the closed J type, subsequently erected, has proved its worth while the main unit was down for repair. It is mounted on the roof of the service building with its top 90 ft. above ground. Main antenna is fed by a ⅜-in. co-axial nitrogen-filled cable kept at 25 lb. gas pressure to exclude moisture. A low-cost 70-ohm cable serves the standby antenna.

Mobile transmitters are rated 8 watts by the manufacturer, 12 watts by FCC. In service men's cars they are installed in special compartments, but line crews and supervisors cars have installations conforming with available space.

Transmitting Control Equipment

Control equipment in the transmitting room includes means for placing the transmitter in "off" and "on" position or standby with indicating lights to show relay positions. Received signal is normally on the loudspeaker in the service operator's office. Picking up the telephone hand set cuts the signal off the speaker and connects it to the telephone receiver, the transmitter is cut in and time delay circuits turn on the transmitter circuits in sequence, indicating when this is done. A switch on the phone set puts the voice on the air. When the phone set is returned to the cradle the transmitter is cut off and standby resumed.

The company has 26 restricted radio-telephones, one second-class and one first-class licensed operators among service operators, service men, crew foremen, supervisors, etc. Third or restricted licenses are generally sufficient, since (1) they are prohibited from making adjustments that might result in improper transmitter operation, (2) equipment design prevents operators from performing operations during normal service that might cause off-frequency operation or unauthorized radiation and (3) adjustments that may affect operation are made or supervised by first-class operators.

Copy of the log kept of all time on the air is shown.

When a two-way car leaves headquarters it is expected to be within call at all times and report "out of service" if the set is turned off, or the operator is doing work carrying him out of range of his speaker. On return he reports "in service."

*Abstract of a paper presented before overhead systems committee of Missouri Valley Electric Association.

Log of Radio Station KAOC

Special Emergency Station

Kansas Gas and Electric Company

Wichita, Kansas

Sheet No. _____ Date _____

Frequency _____ Operator on Duty _____ Time _____

Meter Readings of Transmitter Time _____

Final Amp Current Plate / Grid	Exciter Current Plate / Grid	Filament Voltage	Antenna Current L	Antenna Current R	Plate Voltage	Modulator Current

Time On	Time Off	Nature of Transmission

Operator Off Duty _____

Time _____ Date _____

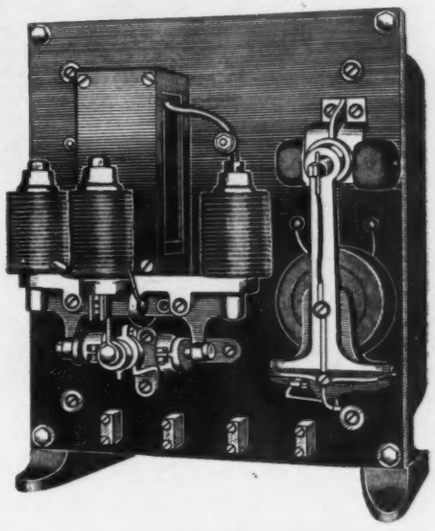
OPERATOR'S log sheet for special emergency radio station of Kansas Gas & Electric Co.

From "Electrical World"
October, 1903

"Just Press a Button"
to start—stop—reverse—accelerate—decelerate
The Monitor System of automatic control for electric motor drive
BALTIMORE
Monitor Controller Company, 111 So. Gay Street.
Chicago: 1060 Old Colony Bldg.
Boston: 77 Franklin Street
Monitor Controller Company, 30 Church Street, New York
1523 Chestnut St, Philadelphia
$2.95

Advertisement Number One...

D. C. Starter Number One



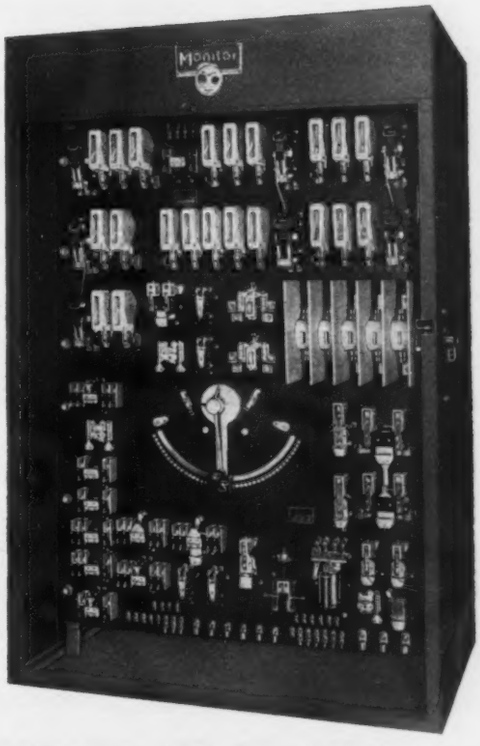
The order came first because this Monitor starter was radically different and considerably better than any other then available.

That was back in the very early days of automatic controls for electrically driven apparatus. And while we aren't sure whether "Order No. 1" is still in use, we have recently unearthed Monitor controls installed 40 years ago that are still functioning smoothly.

With all the improvements and refinements incorporated in our present-day designs they have lost none of that in-built rugged dependability for which the very first Monitor Controls were noted . . . If you value this kind of performance in controls for your equipment why not get in touch with your local Monitor field engineer? . . . Consult your phone book or write the factory direct.

Monitor
BALTIMORE, MD.
The Original
"JUST PRESS A BUTTON" System

Monitor builds automatic electric motor control in all its phases. From fractional horsepower up to 1200 Ampere size . . . Pushbuttons, resistors, rheostats, starters, regulators. The Monitor line is complete.



A Recent Monitor Installation

The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

When Every Second Counts!

THERE'S a high wind outside. Trees on uncleared lines are chafing through insulation or leaning heavily on those important strands of copper. Inside a life hangs in the balance. Will there be a tragic power failure? Don't let such failures happen on **your** lines!

Power interruptions due to trees are a source of trouble you can avoid forever by putting your line clearing up to Asplundh. Our trained experts know what to do and when to do it in the most efficient and economical manner. . . . One of our several types of contracts will meet your requirements exactly. Write for them today.

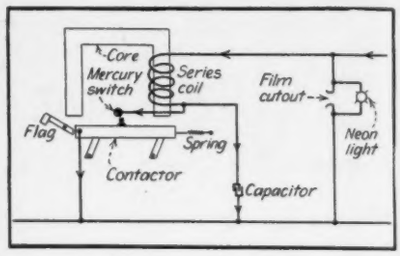
ASPLUNDH
TREE EXPERT COMPANY
Ogontz 3750 **Jenkintown, Pennsylvania**

Chicago, Ill. Binghamton, N. Y. Columbus, Ohio
Cambridge, Mass. Alexandria, Va. Washington, D. C.
Baltimore, Md. Durham, N. C. Rutherford, N. J. Tulsa, Okla.
New Castle, Pa. Pittsburgh, Pa. Omaha, Nebr.

Pole Lines

Capacitor-Booster Costs Less Than $100

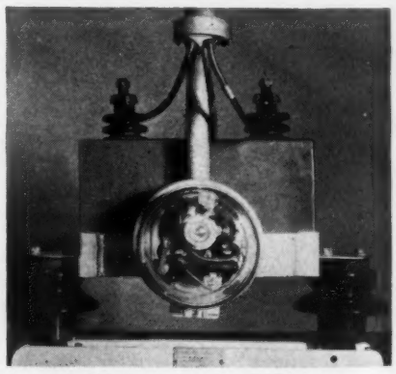
For regulating voltage on a 2,400-volt, single-phase line of Northwestern Electric Company, an automatic series capacitor-booster made principally from spare parts was constructed at a cost of less than $100,



CONNECTIONS of automatic series capacitor-booster

including capacitor and labor. Giving a voltage boost of approximately 11 per cent at 100 percent load and 85 percent power factor, the equipment is good for 25 kva.

In operation, as line current increases, the voltage across the capacitor becomes greater and is added vectorially to the line voltage. The lower the power factor the more in-phase component voltage of the capacitor is added, with resultant boost in voltage.



CAPACITOR-BOOSTER with control made from spare meter parts and mounted on a meter base

The capacitor-booster was designed by Northwestern Electric Company engineers, Ralph Worth being responsible for the assembling and mounting of the control unit on a regular meter base. A relay to protect the device from overload was de-

Transformer Sabotage

The Model T-25 Magnetrol illustrated at left is the unit most universally adaptable to various installation conditions. Other models such as the TF-200 for direct transformer tank insertions and the model F-400 Flow Alarm for water cooled transformers are available.

Note: All Model Magnetrols may be equipped for periodical testing if desired.

Foiled

BY MAGNETROL

PATENTS PEND — TRADE MARK

LOW OIL LEVEL ALARM

The Magnetrol line of low oil alarm relays is providing the utility with the most effective and economical method of combating power transformer sabotage. Designed especially for this service, the Magnetrol assures positive and maintenance free operation through a proven magnetic operating principle which eliminates any possibility of galling or oil seepage. It is a sentinel that's always on the job to sound an alarm whenever low oil level occurs. One Magnetrol to a transformer represents an insignificant cost compared to the value of all the equipment which could be put out of service.

Adopt the program of "one Magnetrol to a transformer"... further information on this device including suggested methods of installation and wiring are yours for the asking. Write today for full particulars.

THE MAGNETROL "DOUBLE CHECK" SYSTEM

The Magnetrol is equipped with a single pole double-throw mercury to mercury switch. This permits the use of a line supervision circuit as well as an alarm circuit to provide instant notification to the operator in case the line to the Magnetrol is broken or tampered with.

FRED H. SCHAUB ENGINEERING CO.
325 W. Huron Street, Chicago, Illinois

RUBBER COVERED POWER CABLES • BUILDING WIRE

ARMORED CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • VARNISHED CAMBRIC

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This cable is of the highest quality, as is the complete line of wires and cables made by CRESCENT.

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER - AGING INSULATION

veloped by E. J. Singrey of the meter department. He provided also a device in the form of a flag to indicate when the equipment has operated.

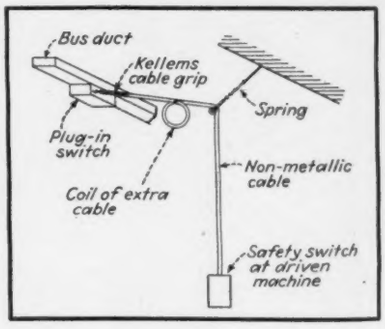
Core of the relay is the core of a discarded potential transformer with one side cut off to serve as a contactor. The latter is mounted on a link assembly, the action of which is retarded by a spring. The arrangement gives a slight time delay, not being almost instantaneous as in the case of a solenoid plunger. On overload the contactor is drawn to closed position and operates a mercury switch, short circuiting the 5-kva. 460-volt capacitor.

A 600–900-volt film cutout provides protection against lightning, switching surges and heavy short circuits. A neon light glows except when film is punctured.

Industrial Power

Non-Metallic Cable Supplies Machines

Accompanying sketch shows a method used by one of the newer Detroit defense plants to build flexibility into the electrical supply to production machines. Metal-inclosed bus duct distributing low-voltage through the plant is tapped with a conventional plug-in type switch near the machine location and non-metallic



cable, attached to the plug-in switch with Kellems-type cable grips to relieve strain, run out to the driven machine. Extra long cables are used so that machine locations can be changed without installing a new length each time the production set-up is changed. Slack cable is neatly coiled and tied in place.

This arrangement, supplementing the considerable flexibility of the bus duct system, speeds installation by

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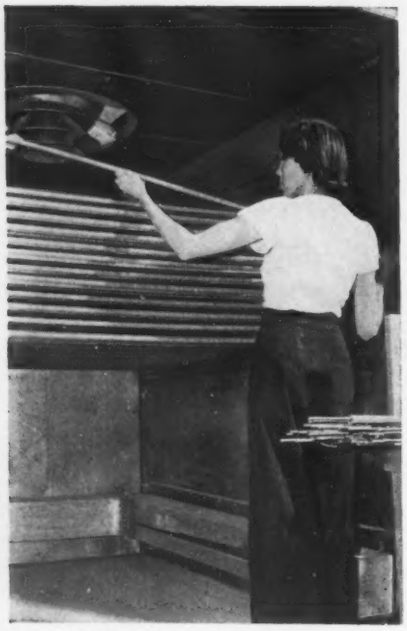
ILLINOIS ELECTRIC PORCELAIN CO. MACOMB, ILLINOIS

eliminating conduit work and makes minor relocation of machines possible in a minimum of time. Installation cost is low, too.

Industrial Heat

Electric Oven Bakes Coiled Electric Cord



COILED electric cords are placed in electric oven for curing

Adaptability of electric heat to close temperature control and even distribution is contributing to the quality of the product manufactured by the Colbell Coiled Cord Company, Santa Monica, Calif. The company's specialty is a newly developed method of coiling electric cords for use with telephones, irons and lamps.

Uncured rubber-covered wire is wound around long rods and placed in a 20-kw. electric oven for a twelve-hour cure. The oven holds more than 50,000,000 ft. of wire. The period of closely controlled baking produces an even cure which stands up well under washing, waxing and polishing, according to R. D. Collins of the Colbell company.

Finished cord stretches easily and is retractable to a small percentage of its length. Coiled telephone cord stretches from only $8\frac{3}{4}$ in. to 7 ft.

• • •

Line Wire Removed by Demountable Reel

Tower Lines

To take down a 20-mile section of a three-wire circuit the Niagara Hudson System used a demountable, metal reel mounted on a tractor and turned by the tractor's power. Amount of copper wire involved was more than 200,000 lb. By use of the equipment a saving in time and labor for the "reeling" and "collecting" operation amounted to 50 per cent of the normal cost. Louis Farrar, superintendent of transmission for power supply, Central New York Power Corporation, worked out the idea and put it in practice.

The reel has a wedge-shaped drum 20 in. in diameter on one end and 19 in. on the other. It is 24 in. wide with flanges 40 in. in diameter. The differences in end sizes allows the wire to be wedged from the drum more easily. The drum can be turned at speeds ranging from 15 r.p.m. to 25 r.p.m. by a chain drive from the tractor to the sprocket gear. About 3,000 ft. of No. 4/0 bare copper wire can be taken up on the metal drum.

When the reel is filled the wire is held in place by metal bands. After the reel is removed from the tractor the wire is wedged loose and the drum is lifted free by the tractor hoist and remounted on the tractor.

The coiled wire is ready for storage or for transfer to a wooden payoff reel for use elsewhere.

Demountable reel and tractor equipment was used to collect the wire, when a 20-mile section of circuit No. 7 was abandoned between Lighthouse Hill substation at Altmar, N. Y., and Central Square, N. Y.

The wire was used again for the tie-in between the new Oswego steam-electric plant and the Niagara Hudson System network at Lighthouse Hill substation.

DEMOUNTABLE REEL on tractor takes up wires, pulling them along the ground after being lowered from the towers (left). Banded coil of wire is wedged loose (center). Drum is lifted free by the tractor hoist (right)

Capacitors Increase Capacity Of Metal Casting Shop

By L. M. DURYEE

Industrial Power Engineer
Connecticut Light & Power Co., Waterbury

Industrial Heat

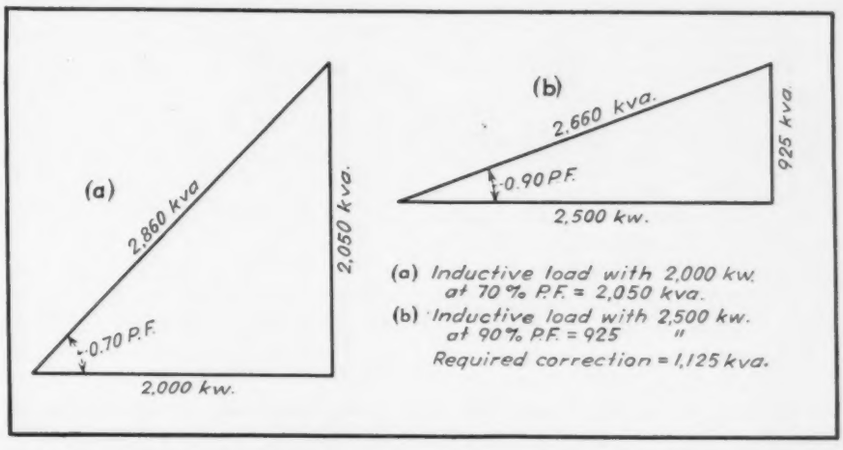
The recent installation of four Ajax induction melting furnaces at the plant of the Seymour (Conn.) Manufacturing Company led to the installation of 1,200 kva. in General Electric capacitors to eliminate serious current overloads throughout the establishment. It was necessary to review the entire plant layout of wiring and transformer capacity in connection with this important addition to the plant equipment, and it was found that no increase in wiring capacity or transformer facilities was necessary if static condensers were provided. The previous power factor approximated 70 percent, and this has now been raised to 90 percent.

The improvement in power factor resulted in a 5 percent reduction in kw. of billing demand, or 125 kw.cut. On the utility's rates, this block, at $1.25 per kw. per month on purchased power, represents a saving of $156.25 per month, or $1,875 per year.

The approximate investment in 1,200 kva. of capacitors was $9,000 installed. The investment which otherwise would have been required to enlarge the plant substation (without computing the value of productive space which would have been occupied) was estimated at $4,000. This gave a net increased outlay for the capacitors of $5,000, and on this basis the installation will be paid for in 2.7 years through the demand charge saving alone.

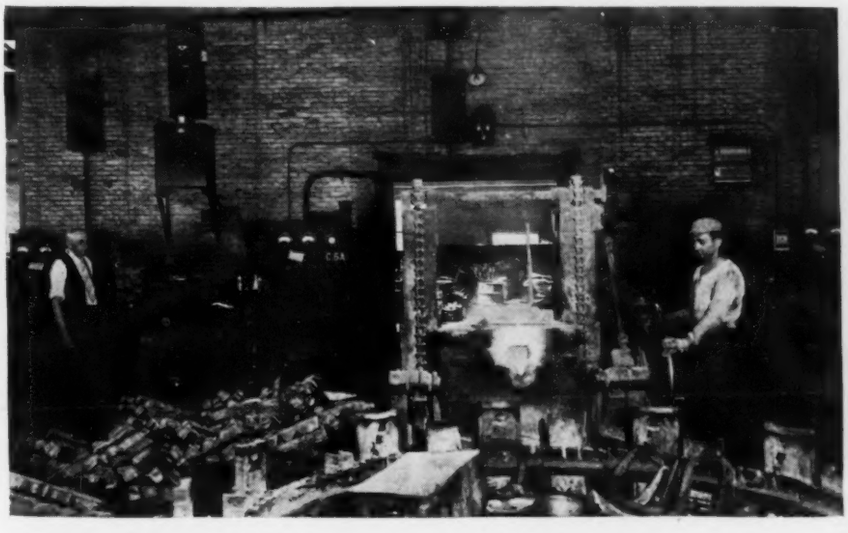
In addition, a situation existed on 300 ft. of varying feeder sizes supplying the anode shop where voltage improvement and reduced I^2R copper losses were necessary. Two static condenser banks of 120 kva. each were installed at the terminals of two arc furnaces, and this voltage improvement materially helped the anode melting speed, as well as reducing copper losses.

The 1,200 kva. of condensers are subdivided so that each induction furnace is supplied with a group of capacitors, each containing 120 kva. Ten banks of 120 kva. each were selected because of the need for distributing the corrective capacity throughout the plant. Each unit is a single-phase, 440-volt outfit mounted adjacent to the equipment served. There are fourteen induction furnaces in the main casting shop and the correction of power-factor has improved voltage conditions to give the desired melting speeds needed to supply the heavy demands made by the defense program upon the plant. The furnaces are operated 24 hours per day and seven days per week. The condensers are connected to the furnace transformer terminals and the casting shop is supplied by two 2,000-amp. feeders, each having two 1¼x4-in. copper buses per leg.



VECTOR DIAGRAM showing reduction in reactive kva. by installation of 1,125-kva. corrective capacity; actual installation 1,200 kva.

While the increase was estimated at 400 kw. for new furnace load, for estimating power-factor correction an increase of 500 kw. at the same power factor was used, to allow for 100 kw. more of motor load.



CAPACITOR UNIT on wall adjacent to 90-kw. induction furnace

After two months of operation the Seymour management reports its entire satisfaction with this solution of the problem of increasing casting shop capacity as economically as possible. The case illustrates utility cooperation in speeding defense material production by helping in the solution of an electrical engineering problem accompanying industrial output expansion.

LOAD BUILDING

Infra-Red Speeds Vultee Production

More planes are being put in the sky for Uncle Sam and the Allies by accelerated production methods made possible by use of 406 infra-red lamps at the Vultee Aircraft plant in Downey, Calif. The protective coating of paint on various airplane materials and parts is dried quickly by infra-red's intense heat, as compared to the hours formerly required. This is one of the largest installations of its kind on the Pacific Coast.

Using the lamps to dry the paint also reduces handling time and produces more satisfactory results, according to Vultee officials.

Sheets of aluminum which later are made into wings and fuselages pass on a roller conveyor under a bank of 100 250-watt lamps mounted 8 in. high. These bring the aluminum up to the correct temperature for receiving the protective coating of paint, which is applied by rollers. The sheets then proceed under a second bank of 110 similar lamps which dry the paint in the few moments it is beneath them on the conveyor.

The processed aluminum then is stacked immediately for stamping and fabrication into various parts of a plane, without the delay for drying formerly entailed, and its requirement of valuable floor space.

The same advantages of speed and good results are received in another use of infra-red lamps at the Vultee plant. Small plane parts which have been sprayed with protective paint are dried under a group of 196 infra-red lamps. These are 250-watt tungsten lamps, mounted 3 ft. above the material.

HEATING and paint drying processes are accomplished on aluminum sheets by two banks of infra-red lamps at the Vultee Aircraft plant, Downey, Calif.

Playground Lighting for 3 Cents a Head

By E. C. PYNN
Superintendent of Parks, West Allis, Wis.

Even starting on the false premise that a city can measure the welfare of its youth in cold, hard cash we find, when all the figures are in, that the cost, so far as night-lighting of playgrounds is concerned, is literally "peanuts," less than a nickel will buy—3 cents worth, to be exact.

Eight Playgrounds Lighted

This is the amount that the city of West Allis, Wis., pays per tousled head to install, operate and maintain its eight floodlighted playgrounds and athletic fields per year. This figure, covering both fixed and operating costs of lighting equipment, is, of course, purely fictional so far as the children are concerned since no charge, except through taxes, is made for the use of the lighted play areas.

West Allis began lighting its eleven playgrounds and athletic fields in 1935, when city officials realized that its existing 23 acres of playgrounds were not enough to care for all the city's youngsters. The problem resolved itself into making better use of what it had—improving the load factor, if you will.

Since 1935, and with the program still continuing, seven playgrounds and the city's high school athletic field have been lighted. The accompanying tabulation shows what the program has cost to date and lists the equipment installed.

Principal item, of course, is the first cost of equipment. Upkeep and

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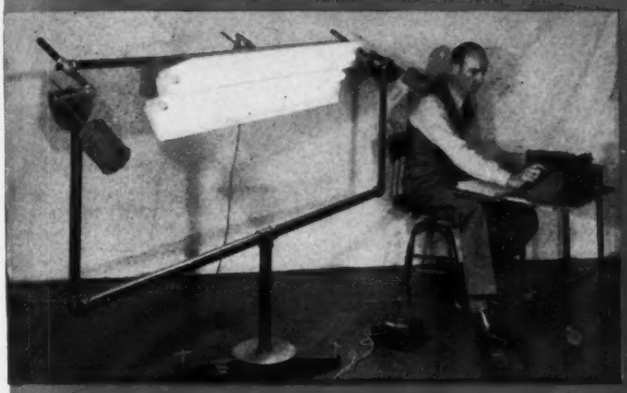

FLEUR-O-LIERS give maximum light output, valuable help for vital "all-out" production. And their efficient lighting performance is verified by impartial experts through tests like this.

Certified ballasts. This test checks ballasts to insure reliable, balanced operation. It looks like a long pull ahead. So, today, certified high quality equipment is more important than ever!

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the cost of electricity are relatively very small items. Of the total installed cost of $49,123, or $112.66 per outlet, equipment and material cost $33,283 and labor, both city and WPA, $15,840, or $76.33 and $36.33 per outlet respectively.

On the basis of one lamp replacement per year per unit, the annual maintenance cost amounts to $1,820.

Six of the eight fields lighted to date are served at 13.2 kv., with energy metered on the primary side. In the remaining two metering is on the secondary side and energy consumption grouped with that of adjacent school buildings. Estimated annual energy consumption for all play areas is around 158,200 kw.-hr., for which the cost is an estimated $2,880 a year.

Annual Cost $4,025

Depreciating the $49,123 investment over a fifteen-year period and applying an average interest rate of 3 percent, interest and fixed charges amount to $4,025 a year. Applying this figure to the energy cost and maintenance it is estimated that the cost of operating the lighted playgrounds amounts to the sum of $8,723 annually.

A study of attendance records for the past year reveals that around 602,000 people used the playground facilities. Of this number roughly 300,000 use the playgrounds at night. Or, expressed in different terms, if it were not for the lighted playing fields attendance at the playgrounds would be only about half what it now is. Charging the cost of the night lighting against those using the lighted fields the cost per unit of attendance is 2.9 cents, or about 3 cents each for one evening's fun.

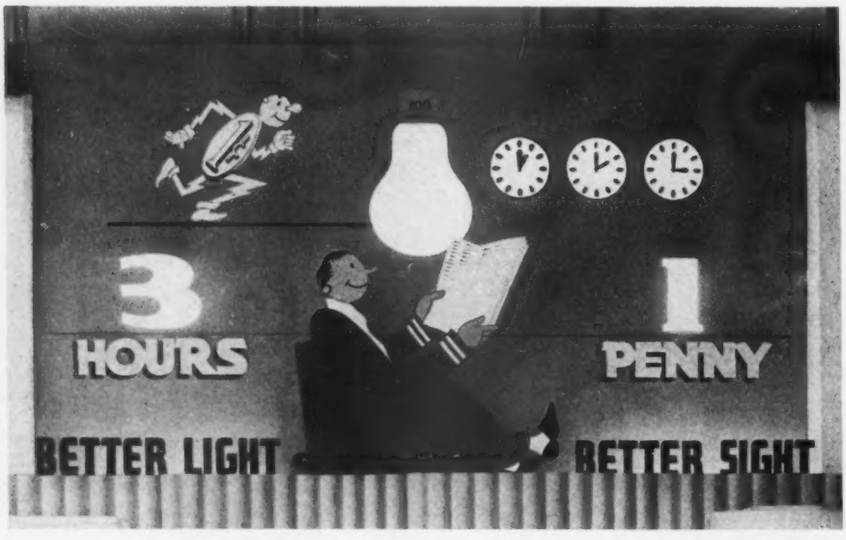
It is impossible to measure the results that an industrial-residential community such as this (37,000 population) derives from lighted play areas, but it is possible to state with confidence that the withdrawal of such areas in the case of West Allis would be a loss that would be greatly resented by a citizenry which has grown to rely on them as part of its pattern of living.

Summary of Playground Lighting Facilities in West Allis, Wis.

	Type of Service	No. & Size Transformer Kva.	No. of Lamps and Receptacles: 1,500 Watt	1,000 Watt	500 w. or Less	Receptacles	Kw. Load	Cost of Equipment
1. McKinley School	Secondary	1–50	36	5	..	1 Loudspeaker	59	$1,975.91
2. Jefferson School	Primary	1–37½ 1–50	28	18	..	.....	60	4,402.55
3. Woodrow Wilson School	Primary	1–50	33	5	..	1 Loudspeaker	54.5	2,945.69
4. High School Stadium	Secondary	2–50	64	..	..	1 Spotlight	96	5,308.25
5. Washington Playground	Primary	2–75	41	50	55	2 Loudspeakers 1 Spotlight	118.26	8,214.36
6. Lincoln & John Dewey School	Primary	1–75	17	16	..	1 Loudspeaker 1 Spotlight	43.50	3,145.55
7. Longfellow School	Primary	1–75	12	..	..	1 Loudspeaker	18	914.47
8. Franklin School	Primary	2–50	38	..	8	1 Loudspeaker 1 Spotlight 1 Stage light	61	6,376.70
Totals	.....	1–37½ 5–50 3–75 3–50 (W.E.P. Co.)	267	94	63	12	510.26	$33,283.48

Summary of Playground Lighting Cost

Initial Investment		
Equipment and material	$33,283	
Labor — WPA and city	15,840	
	$49,123	
Annual Cost of Operation		
Fixed Charges and Interest		
Depreciation — 15-year basis	$3,275	
Av. interest — per year at 3 percent	750	$4,025
Operating and maintenance charges		
Electricity — 158,196 kw.-hr. (est.)	$2,878	
Lamp replacement — one lamp per fixture per year	1,820	$4,698
		$8,723
Attendance under lights per year (est.)		300,000
Annual cost per unit of attendance (cents)		2.9



ALWAYS A "BUY"—Few visitors to Hartford Electric Light's main office miss this home-made wall display featuring the low cost of using a 100-watt reading lamp in the home. At 3½ cents per kilowatt-hour, a 100-watt lamp, which used to be regarded by housekeepers as a rather high-priced unit for liberal employment around the house, consumes in three hours but 1 cent's worth of energy. Promotion like this is a factor in the company's annual rate of residential use of electricity, of 1,375 kw-hr. per home customer

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Typical installation of Wiremold for lighting and utility circuits in an industrial building.

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Furthermore, wiring that is enclosed in strong, safe Wiremold Surface Metal Raceways is always readily inspectable, less subject to unnoticed deterioration, completely protected. Wiremold Raceways meet all Code and Underwriters' requirements yet their compact, thin wall construction conserves steel.

These are some of the reasons why architects, electrical contractors and plant or building managers now favor Wiremold Wiring Systems for initial wiring installations in new factory, school, office, and commercial buildings. Wiring or re-wiring, Wiremold does a better job in the first place and lays the foundation for further economies through the years.

Catalog and Wiring Guide on request.

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RLM

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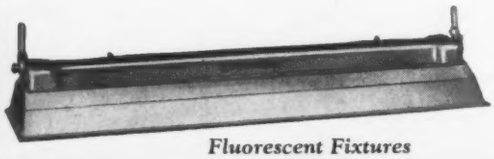
Stocklite

High Bay Fixture

Vaporlite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Literature is available on all Goodrich fixtures. Catalog sheets on request.

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Water Heater Report by E.E.I. Committee

In an interim report, recently issued, the electric water heating committee of the E.E.I. recommended that the electric utility industry, through the Institute, accept NEMA standards for electric water heaters pertaining to wattages, voltages, watts per gallon and thermostat settings.

Standard wattages of 600, 750, 1,000, 1,250, 1,500, 2,000, 2,500, 3,000, 4,000 and 5,000 were accepted and the suggestion made that the number of units be reduced still further when practicable.

236 Volts Is Standard

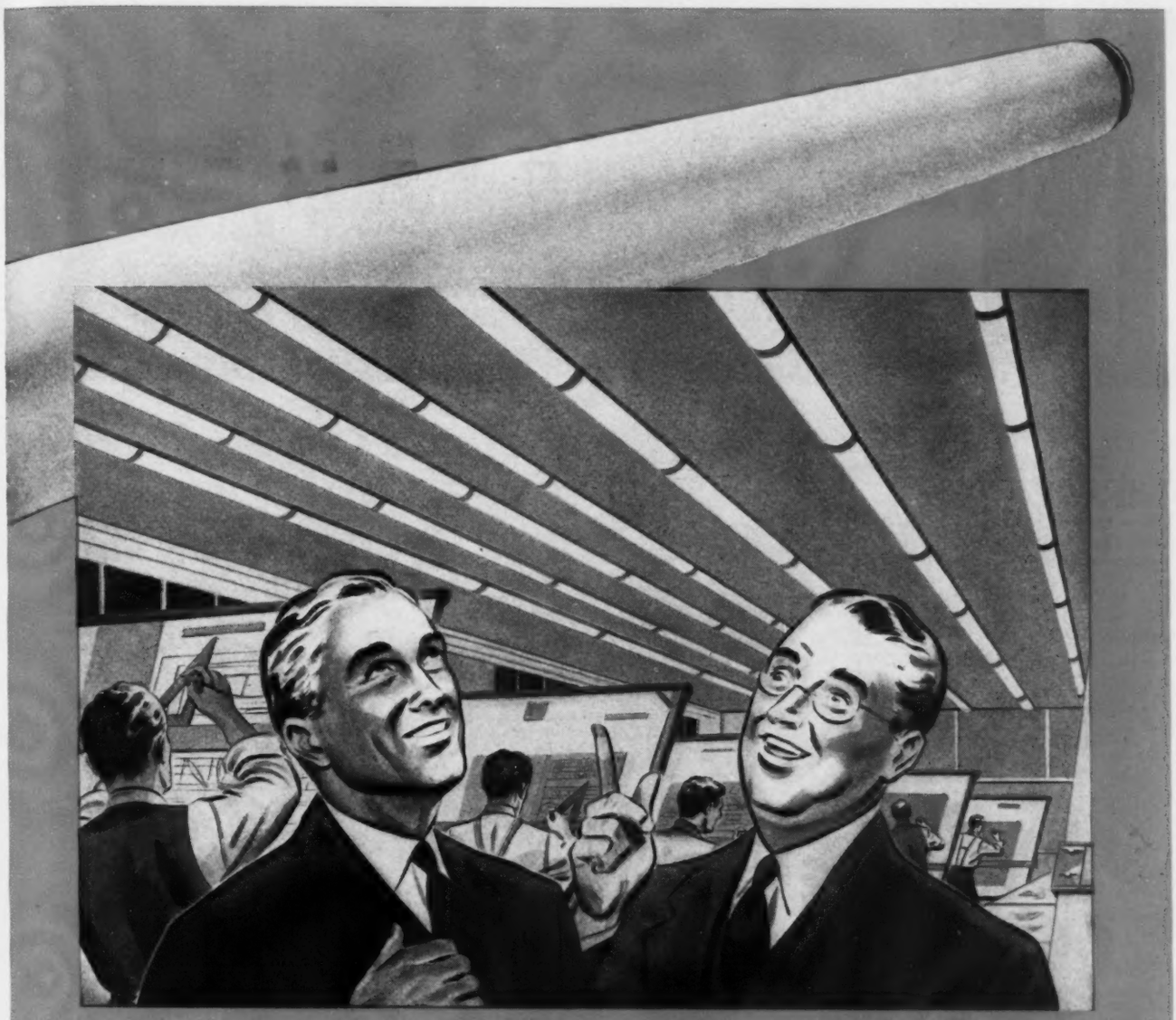
Design voltage was set at 236 volts at terminals when energized, with rating of 230-240 volts. This corresponds to the approved standard design voltage for the electric range the committee reports, and which was agreed upon by a joint E.E.I.-NEMA committee. Without favoring any particular voltage, it is recommended that the established voltage rating of water heaters be made consistent with the range standard.

The ratio of wattage to tank capacity for two-unit heaters, 30 gal. or larger, is 20 watts per gallon for bottom unit and 30 watts per gallon for upper unit, both to nearest standard wattage of units. Since the E.E.I. questionaire was issued NEMA approved two series of wattages for single-unit heaters providing 50 and 20 watts per gallon of tank capacity respectively, utilizing heating units rated from 1,000 watts up to and including 3,000 watts. As 62 percent of the companies approved the ratios adopted by NEMA the committee recommended that they be adopted.

Set Thermostats at 150 deg.

Full acceptance was given also of setting for adjustable thermostats at 150 deg. (factory setting) for all units and for an "on-off" differential of 10 deg. (plus 5 deg. or minus 2 deg.) for bottom unit and 25 deg. (plus or minus 5 deg.) for top unit.

To promote standardization the committee made three recommendations: (1) That consideration be given to the establishment of performance values or range of values in the water heater test specifications; (2) that tank sizes be more adequately standardized in the manufacturing and plumbing industries, and (3) that further investigation be made of plumbing practices and the use of safety devices possibly by a committee comprising utility installation and service personnel, plumbers and manufacturers.



LET'S SEE TO IT THAT GOOD LIGHTING DOES ITS PART TO WIN THE WAR

We can help our nation's war program by helping every vital plant, every vital business make the best use of lighting. Good lighting helps speed production by enabling workers to see more easily. Good lighting helps build employe morale. Good lighting helps reduce fatigue and mistakes. Telling the nation's production men these advantages is our obligation. Getting our plants and factories to enlist the services of better lighting is what we can do in '42. Westinghouse Electric and Manufacturing Co., Lamp Division, Bloomfield, N. J.

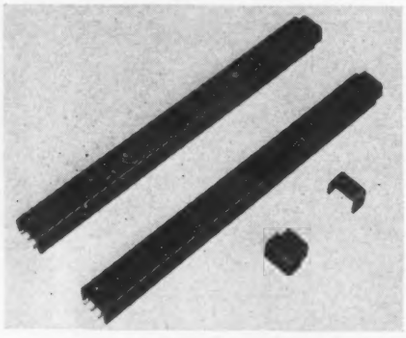
For More Top-Quality Lighting Installations—

Westinghouse MAZDA FLUORESCENT LAMPS

NEW EQUIPMENT

Wiring System

New type of surface wiring system employs two basic materials—tubular conductors incased in plastic housing. It has only four basic parts—feed and outlet sections and male and female end caps. Each 16-in. section has two outlets, providing an outlet for every 8 in. of circuit run.



Series Nos. "200" and "300" sectional plastic wiring; rated 35 and 45 amp. (not interchangeable), two or three wire, 115/230 volts d.c. or single phase a.c. final circuits. **Pierce Laboratory, Inc.**, Summit, N. J.

•

Incandescent Lamp

"Verd-A-Ray" incandescent lamp; sizes 40 to 1,500 watts. **Save Electric Corp.**, Toledo, Ohio.

New bulb has ceramic "glass-on-glass" filter coating. It is said to have less red and more green-yellow rays, making it glare-free and creating about the same effect as ordinary light on "eye-ease" (green) paper. Current consumption is same as standard lamps of equal wattages, it is claimed.

•

Insulator

Corrosion- and leak-resistant pipe insulator. **General Electric Co.**, Schenectady, N. Y.

Pipe insulator, developed for cable systems which require insulation between cable sheaths or joint casings and oil supply reservoirs connected to joints and terminals, has small annular channels provided in plastic portion of insulator, into which are molded gaskets of C-1000 rubber. These gaskets are said to form a tight seal between the plastic and brass of the inserts, thus preventing development of any leak because of differential expansion and contraction.

•

Rheostat

Fine adjustment rheostats; various sizes for ohmic and current values. **Rex Rheostat Co.**, 3 Foxhurst Rhoad, Baldwin, L. I., N. Y.

Two windings are arranged on the same tube. Wire of winding for fine adjustment is said to have about five times the cross-section area of main winding serving for coarse adjustment.

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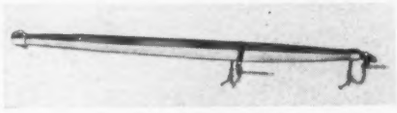
Gin Pole

Laminated wood gin pole has been designed for use in lifting heavy conductors, insulator strings, hardware, etc. It provides



Gin pole; tested to withstand 75,000 volts per foot for five minutes. **A. B. Chance Co.**, Centralia, Mo.

a means for obtaining additional working height of 5 ft. above the pole. Two chain tighteners are furnished to fasten gin on pole. Bottom brace on end swivels in any direction.

•

Camouflage Paint

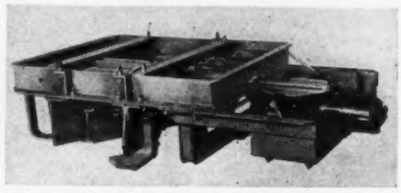
Paint; protective concealment shades. **Subox, Inc.**, 348 River Road, North Arlington, N. J.

A single-coat maintenance paint is made available in various shades to provide a desired "hiding effect" for towers, substations, etc.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Track Switch

Electrically operated track switch is designed to enable tramrail operator to preset the switch at a distance ahead while traveling, or indexes to actuate trippers which will cause a switch to take the position desired. Assembly with curved and straight rail is set in position by a motor-driven cam through a lever arrangement.



Motor-driven track switch. **Cleveland Tramrail Division** of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

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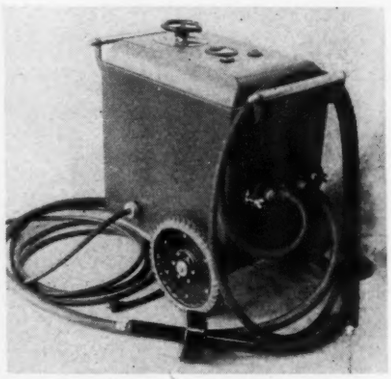
Test Set

Portable insulation test set for Diesel-electric locomotives and other railroad electric equipment includes as a unit a high-voltage transformer, a means of regulating the test voltage and necessary overload and overcurrent devices. Secondary windings of air-cooled transformer are designed for series or parallel to make available two voltage ratings.



Insulation test sets; for operation on 120-volt, single-phase, 60-cycle supply. Capacities, ½ kva., 0-1,500 or 0-3,000 volts, for Diesel-electric locomotives up to 600 hp.; 2 kva., 0-3,000 or 0-6,000 volts, for heavier locomotives. **Westinghouse Elec. & Mfg. Co.**, East Pittsburgh, Pa.

MANUFACTURING-MARKETS

Construction Hits New High in 1941

Engineering construction awards in 1941 climbed to $5,868,699,000, the highest volume in history, and 47 percent above the previous all-time mark of 1940 as reported by *Engineering News-Record*. Of this total, $3,823,397,000 or 65 percent, is defense construction.

Public awards reached $4,690,617,000, boosted to a new record by defense work, and 66 percent above the former high of 1940. Defense was responsible for $3,405,798,000 or 73 percent of this total. Federal work, $3,500,488,000 climbed to a new peak, 141 percent over the 1940 total, and was responsible for the public gain as state and municipal awards, $1,190,129,000, were 13 percent below a year ago.

Private construction, $1,178,082,000 exceeded the preceding year by 1.5 percent and was the top figure reported since 1930. Of this, $417,599,000 was direct defense construction, 35 percent of the total.

Every section of the country reported substantial gains over 1940, and five of the six regions rose to new highs.

•

Predicts Plastics Will Retain Recent Gains

The majority of manufacturers who have been forced to adopt plastics for their products to replace vital metals will never go back to their original materials, when the emergency is over, Donald S. McKenzie, sales manager of the plastics department of General Electric Co., said at a recent meeting of the Sales Executives Club of New York. Such makers, he said, have found that plastics have not merely solved their material problem, but generally provide a more saleable, lighter-weight or better-looking product.

Mr. McKenzie said the plastics industry is now devoting about 75 percent of its production to the war effort and the other 25 percent for civilian goods is rapidly declining.

•

Motors, Generators, T. & D. Orders Drop

Index of orders received for motors and generators during the month of November continued the downward movement reported in October, according to figures released by the National Electrical Manufacturers Association. The index value declined 3.1 points to 329.7 from the October index of 332.8, a decline of 0.9 percent.

The index of orders received for transmission and distribution equipment declined from the record high made in October, declining 30.2 points to 354.5 from the October index of 384.7, a decrease of 7.9 percent.

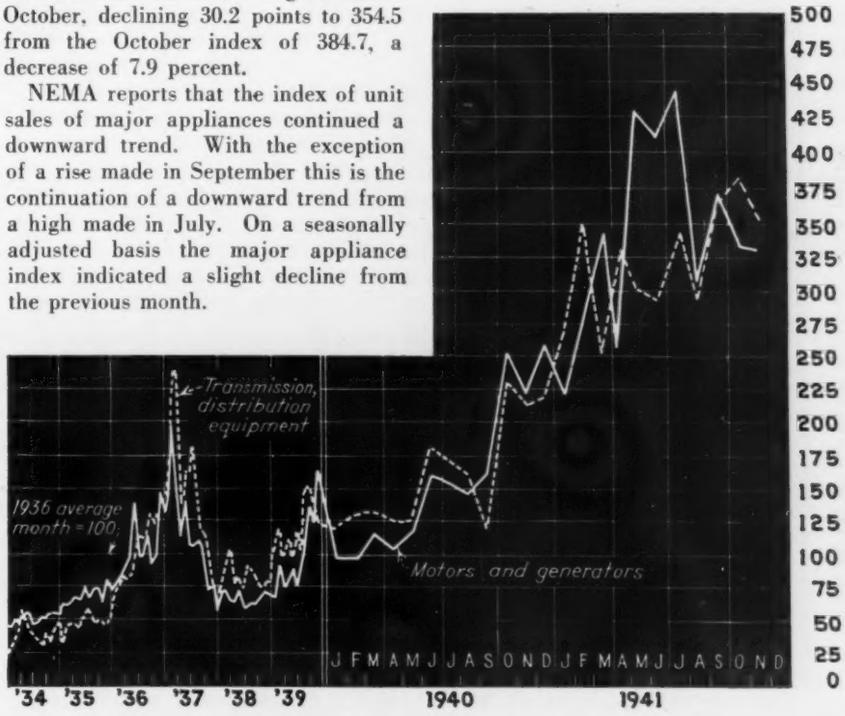
NEMA reports that the index of unit sales of major appliances continued a downward trend. With the exception of a rise made in September this is the continuation of a downward trend from a high made in July. On a seasonally adjusted basis the major appliance index indicated a slight decline from the previous month.

Ceiling Imposed on Insulation Materials

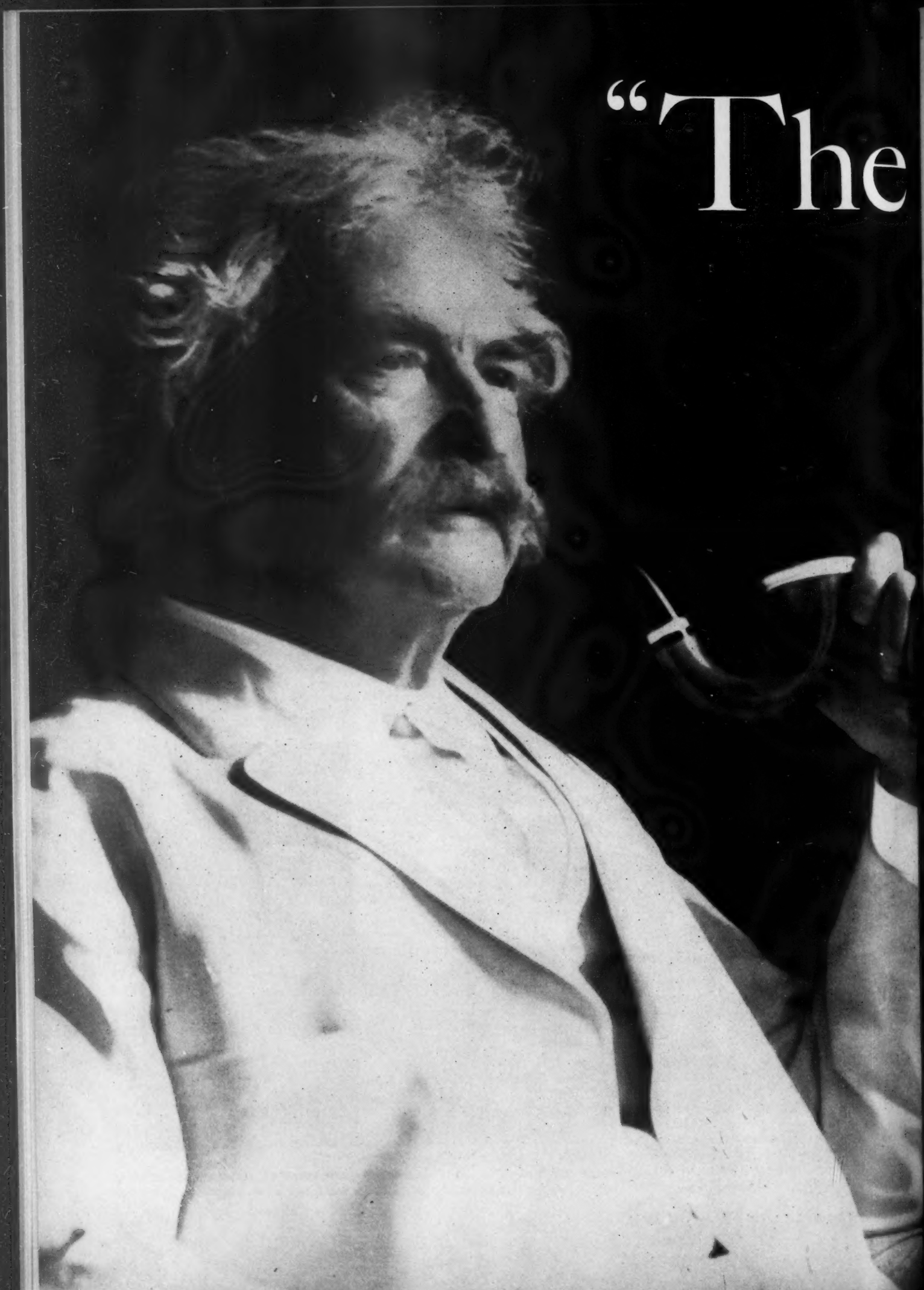
Carnauba, beeswax and candleilla waxes—among raw materials used in electric cable insulation—appeared this week as additions to the list of materials for which the Office of Price Administration has set maximum prices, or "ceilings."

Importers, refiners and processors of these waxes met in New York City with representatives of the OPA to discuss proposals for stabilization of prices. The conferences followed previous telegrams—one in late December and one in early January—which "froze" prices at certain levels. Attendance of Office of Production Management representatives was seen as an indication of interest in stockpiles.

According to an OPA representative



NEMA INDEX, value of orders received for motors (large d.c. polyphase synchronous) and generators (engine, belt-driven); also for transmission and distribution equipment


"The

rumor is exaggerated!"

MARK TWAIN was once asked to comment on a newspaper story that announced his death. "You may say", he told the reporter, "that the rumor is exaggerated".

This is an old anecdote. But its application to PYREX brand insulators is new and to the point.

Due to circumstances beyond our control, the past few months have seen some delays in our deliveries of PYREX suspension insulators. As always in such cases, the reasons suggested by outsiders have been many and varied. It has even been rumored that we are so heavily engaged in filling government orders for insulators that we are unable to accept orders from private customers. *Nothing could be further from the truth.*

It is true that we have been given greatly increased responsibilities in our country's defense efforts. For example, in recent months the Bonneville Administration (which supplies power for much of our aluminum production) purchased 180,000 PYREX 10″ Suspension Insulators, the Bureau of Reclamation took 50,000 more, and so on. We are rightfully proud that our insulators have been drafted for such important guard duty. It speaks well for our product.

For important tie-lines built during the last four months, Georgia Power and Light received prompt delivery of 11,000 PYREX 9″ insulators and Florida Power Corporation received 4,000 insulators. Other purchasers are getting the same good service.

And here's a promise: Insulator production at Corning has been and is today shattering all previous records—but we are going to increase it further.

We have the glass. We are ready to step up deliveries of complete units as fast as orders reach us with priority ratings necessary to get metal for insulator caps and pins.

PYREX brand Suspension Insulators—available in 6″, 9″ and 10″ sizes and in all types and spacings.

20 PYREX INSULATOR DISTRIBUTORS

PYREX brand insulators are represented by 20 of the finest distributors in the country. During this peak period they will do their utmost to fill your orders as promptly as possible. Insulation Division, Corning Glass Works, Corning, N. Y.

"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

CORNING *means* Research in Glass

Pyrex Insulators
BRAND

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Insulation Testers, Ground Testers and Ohmmeters

Today's Events

are emphasizing the importance and the dependability of these world-famous testing instruments, for detecting and preventing trouble in electrical equipment.

Do you have full information on how to operate and use them? Write for—(no charge)

Pocket Manual of "Megger" Practice No. 1420-W
Technical Bulletin on Ground Testing No. 1285-W
Ducter Ohmmeter (for quick measurements of very low resistance) Bulletin 1635-W

James G. Biddle Co.
1211-13 ARCH STREET Electrical and Scientific Instruments PHILADELPHIA, PA.

at the meeting, no shortages of these imported waxes appear imminent; ceilings are being imposed merely as an extension of the price control policies of the OPA.

•

Profit of $337,788 Shown by Reliance

Reliance Electric & Engineering Co., Cleveland, Ohio, showed a net profit for the first ten months of 1941 of $337,788 after provision for estimated federal income taxes of $510,000 and after all charges, including depreciation on plant and equipment amounting to $112,276. This compares with a 12 months' net profit of $356,740 for 1940.

During the ten months ended October 31 the company entered orders aggregating $8,173,792, and carried forward on November 1, 1941, business unshipped and in process amounting to $4,692,177, as compared with about $2,300,000 on January 1, 1941. Earnings for the ten months' period were equivalent to $2.25 per share on the 150,000 shares of the company's stock outstanding.

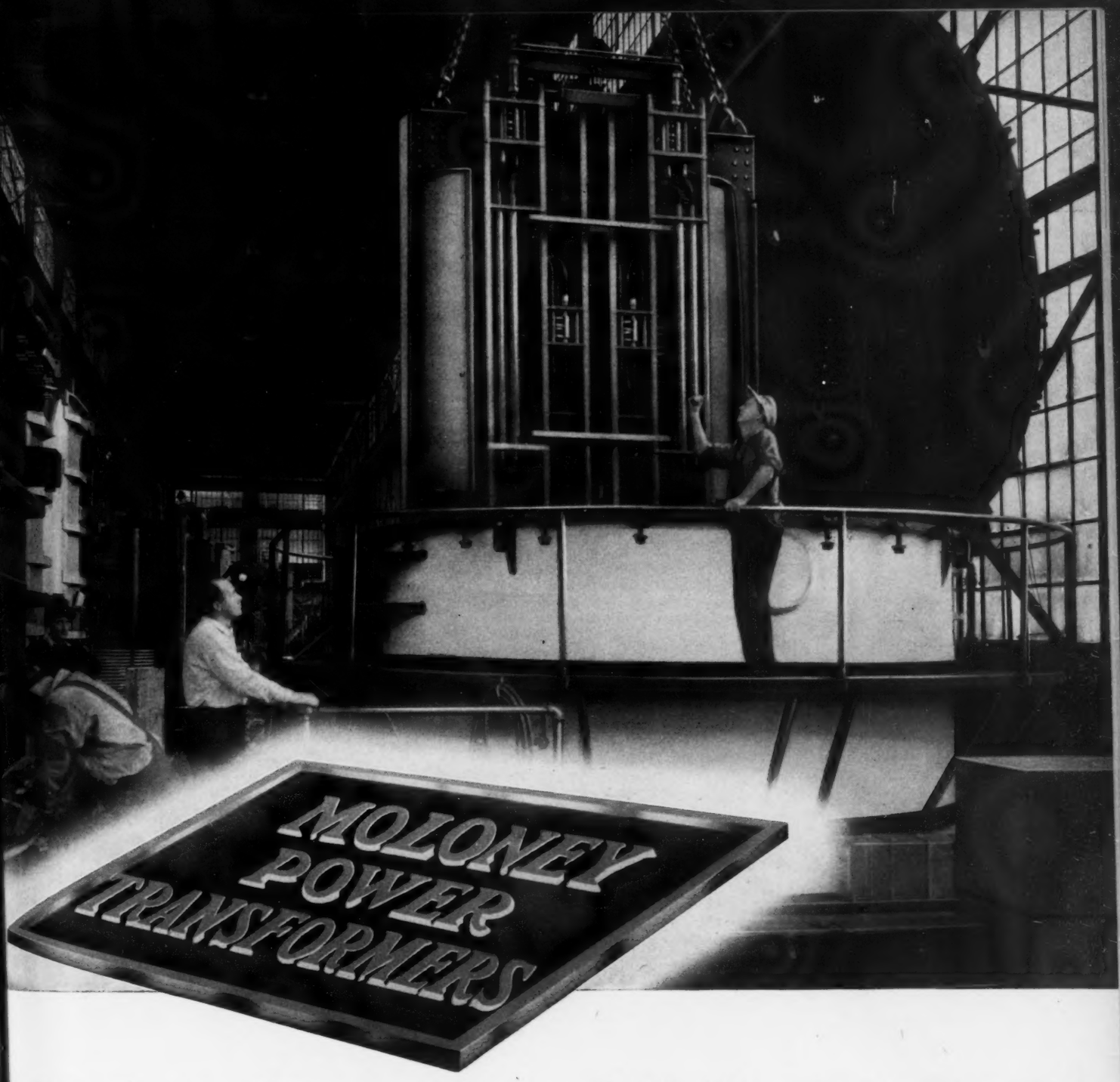
In his letter to shareholders accompanying the report, Clarence L. Collens, president of the company, stated that production is now at practically maximum capacity, with three shifts. Mr. Collens added: "Fortunately, the electrical products manufactured by the company are essential to the defense program and to the prosecution of the war, and it has not been necessary to make the serious readjustments which some industries have faced, or to seek contracts for defense and war products differing materially from those previously manufactured."

In a letter to stockholders the company announced a plan of recapitalization providing for the issue of new convertible preferred stock for the purpose of securing additional working capital required by the company because of increased operations due to production of war and defense needs. The plan proposes the issuance of 7,500 shares of convertible preferred, bearing annual cumulative dividends of $5 per share. A stockholders' meeting to pass upon the plan has been set for January 26.

New York Metal Prices

	Jan. 20, '42 Cents per Pound	Jan. 14, '42 Cents per Pound
Copper electrolytic	12.00*	12.00*
Lead, A. S. & R. Price	6.50	6.50
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc, Spot	8.64	8.64
Tin, Straits	52.00	52.00
Aluminum, 99 percent	15.00	15.00

* Delivery Connecticut Valley.



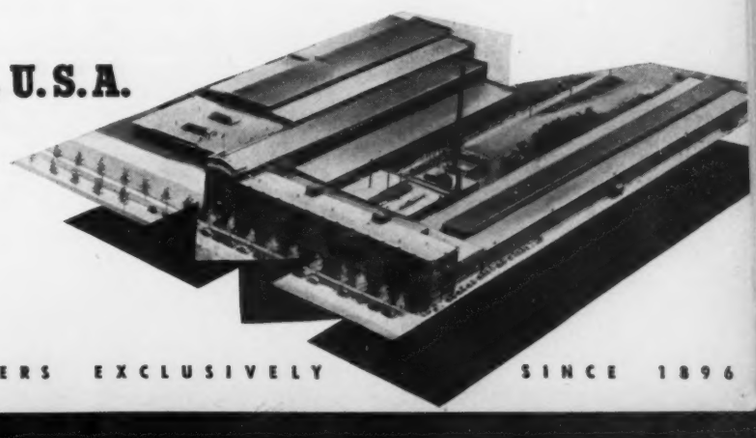
Pictured above is a Moloney 21,000 Kva 161,000 volt core-and-coil assembly being lowered into one of the large vacuum tanks for drying treatment.

Moloney has all the necessary experience and facilities for designing, building and testing large power transformers. The Moloney background is supplied by over 45 years of experience in the exclusive manufacture of transformers.

Capable design engineers incorporate modern practices in these transformers. Skilled labor and adequate processing facilities accurately translate the design into the finished product.

Take advantage of Moloney Power Transformer experience and facilities. For prompt quotation, address your next inquiry to Moloney Electric Company, St. Louis, U. S. A.

MOLONEY ELECTRIC CO. • ST. LOUIS, U.S.A.



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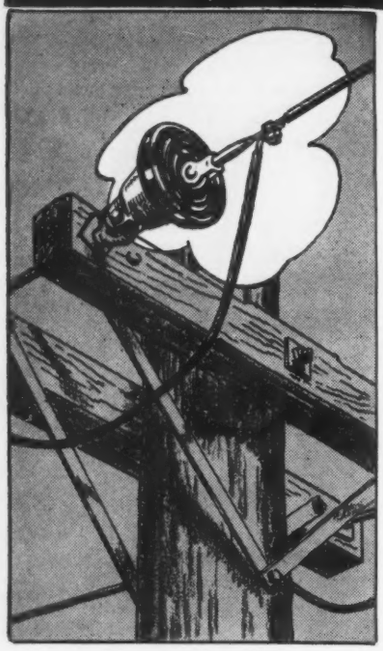
DISTRIBUTION
PRACTICE—



RELIABLE
STRAIGHTLINE
DEADENDS

Reliable short rigid clevis type deadends make neat installations and are particularly suited to locations where taps are made well out from the pole to provide climbing space and where weatherproof wire is used. They can be fully covered by standard line hose when working hot. Low in cost. Dependable in performance.

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
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Field Reports on Business

Rising momentum of the war effort is causing drastic changes in many phases of business, with the extensive conversion of consumer goods manufacturing plants to war production. The upswing in retail buying, some retailers believe, represents business borrowed from later months this year.

NEW YORK

Reports from every part of the country indicate the rapidity with which conversion of consumer goods manufacturing plants are being converted to the production of war materials. Officials estimate that approximately 8,000,000 persons now employed in civilian production will eventually be transferred to war plants.

Engineering construction awards last week totaled $83,262,000, a decline of 41 percent from a week ago, and 7 percent under the volume for the corresponding week a year ago, as reported by *Engineering News-Record*. Public construction was 44 percent lower than last week, but 42 percent higher than in the 1941 week as a result of the 114 percent increase in federal work. Private awards are 9 percent under a week ago and 70 percent below the total for the week last year. The week's total brought 1942 construction to $279,446,000 for the three-week period, a decrease of 15 percent from the $329,541,000 reported in 1941.

Cost of living in December was about 8 percent higher than the same month last year, according to the National Industrial Conference Board. The high level of retail spending throughout the nation is being maintained. Department stores in the metropolitan area scored the sharpest advance of the year to date last week, sales rising 39 percent over the corresponding week of 1941.

NEW ENGLAND

Plans for the expansion of shipbuilding facilities announced by the Maritime Commission last week include the construction of a large new yard in this area and the allocation of contracts for the building of 60 cargo type carriers to two Maine shipbuilding companies. A large volume of heavy electrical machinery and switching equipment for machine shops, lighting for yards and shops, together with additional electric welding machines, are some of the items which will be bought as soon as possible. Bethlehem Shipbuilding Corp. plans to rush construction of a plant at Hingham, Mass., to employ 20,000 workers in the production of corvettes for convoy duty. It is estimated that the demand will be about 10,000 kw. and two substations fed by multiple 13.8-kv. lines.

Bendix Corp. is to build a permanent plant at Norwood, Mass., for manufacturing instruments used in aviation. About 1,100 persons are to be employed later. An electrical installation of 1,500 kw. will be provided, and energy purchased from the local municipal distribution system which is supplied in bulk by the Boston Edison Co. Small motor sales to machine tool builders are keeping up at a good pace and deliveries are being carried out promptly for priority bookings. Electric cable orders are well distributed among manufacturers in this district; switches and panelboard supplies are moving in large volume. Floodlighting units, alarm signal systems and supplies for blackout requirements are in demand. An order for $90,000 of electric running signal lights was booked recently; appropriations for air-raid alarm installations are being passed by municipalities located along coastal areas in New England. Major appliance sales among a group of Vermont central stations topped the 1941 quotas.

CHICAGO

Despite the increasing number of job dislocations and production losses because of stricter curtailment of critical materials, business, in general, keeps moving along at record levels. Conversions to war production are being accomplished as rapidly as possible, which is materially assisting many plants from complete shutdowns.

Employment and payrolls in this district reached an all-time high at the end of 1941. Industrial production continues at record levels, although delays in securing critical materials have a tendency to slow down the program. Retail trade is soaring because of the fear of shortages. Residential construction has declined in recent weeks.

Of 29 manufacturers reporting December sales to the Electric Association, 21 had increases over November, whole 29 showed gains over the comparable month in 1940. For the entire year every manufacturer reported an increase.

Commonwealth Edison Co. is negotiating private sale of $25,000,000 first mortage bonds to provide additional funds needed for its extensive construction program.

Electrical permits show sizable installations being made for the following: Dole Valve Co., 190 lights, 36 motors totaling 121 hp.; Blackstone Hotel, 54 circuits, 380 lights; Broadway Branch Library, 32 circuits, 363 lights, 7 motors; Continental Can Co., 45 additional outlets, 222 fluorescent fixtures; R. R. Donnelly & Co., 8 motors of 87 hp.

PACIFIC COAST

The coast is beginning to react to the gradual closing of many eastern factories to all but war work and the consequent gradual absorption of their local representatives, particularly appliance men, in defense work. One immediate result is the quick sale to dealers of any stray lots of clocks and hollow-ware in expectation of a "last chance" consumer demand.

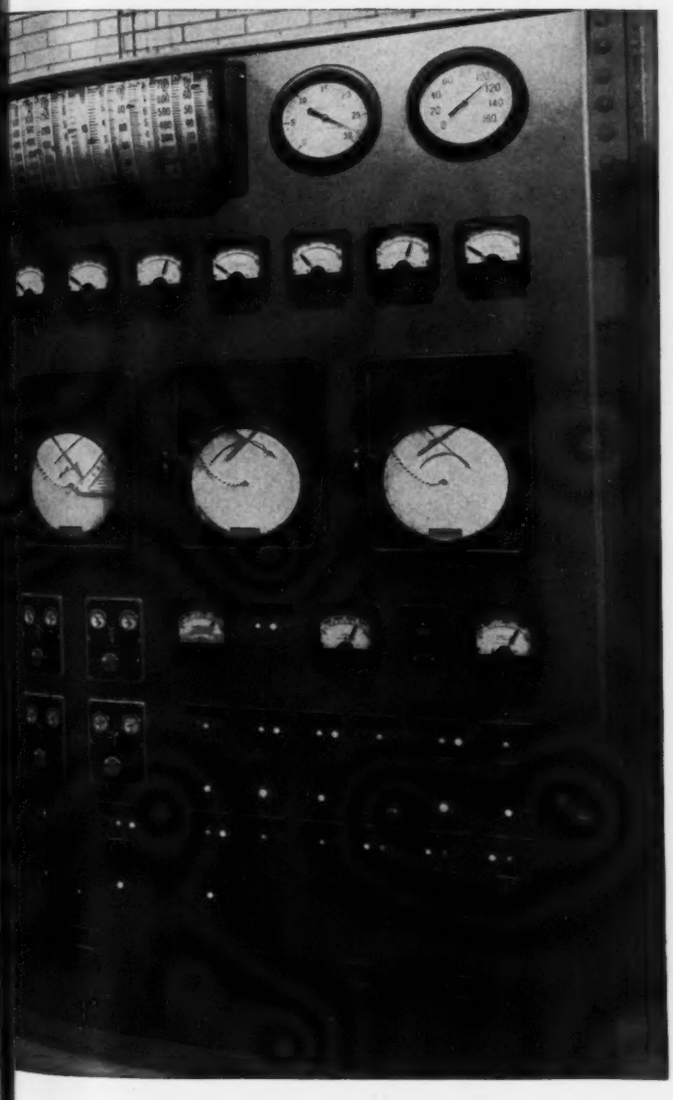
Western building construction decreased sharply during December, the building permit total for the seven western states being $22,879,000, as compared with $36,948,000 in November and $42,288,000 for December, 1941. This ratio of decrease was pretty constant through all the states.

The new Pacific Gas & Electric plants at Dutch Flat and the Narrows, in Central Sierra region, are actively under construction and scheduled for completion about July and November, 1942, respectively.

Recent varied orders of interest include $150,000 of motor generators and battery chargers for a naval base, $40,000 transformers for a shipyard, large quantities of wire, cable rings and hangars for Signal Corps, 15- and 23-kv. G. E. circuit breakers, costing $171,853, for Bonneville system substations, $19,375 Corning insulators for Coulee lines, $21,000 control equipment for Big Thompson system and $70,509 for constructing Kelso-Longview section of Bonneville-Coulee transmission line.

# of Modern Capacity

element Control



★ One of the most important and exacting control assignments on the modern steam generating unit is that of feed water control. Small water storage, water-cooled furnaces, sensitive economizers, superheat control, and the extreme flexibility of units fired with fuels in suspension all tend to complicate the problem.

Bailey Three-element Feed Water Control was conceived to solve this problem. How well it has succeeded is a matter of record—the safety of over 100,000,000 lb. of modern steam generating capacity is entrusted to its dependable operation. This total is made up of boilers operating at pressures from 150 lb. to 2500 lb. with individual capacities ranging from 50,000 to 1,200,000 lb. per hour.

Bailey Three-element Control is further endorsed by scores of repeat orders from satisfied users. Some of the features which have resulted in this well deserved popularity are:

1. Control of Feed Water is primarily from the rate of Steam Flow.
2. Dependable response at low rates of steaming is obtained by controlling from the actual measurements of standard Bailey Steam Flow, Water Flow, and Water Level Meters.
3. Fast positive control valve action is insured by the use of an outside power source.
4. Metering of feed makes system independent of variations in excess pressure.
5. Speed and accuracy of system maintains level within safe limits even under loss of load or sudden load pick up.
6. System provides for remote manual operation from the boiler panel when desired. Control valve position is always indicated at panel regardless of manual or automatic operation.
7. Complete records of performance are made by the Steam Flow, Feed Water Flow and Water Level Meters used with the system.

If you do not already have information on this fast, dependable system of feed water control, ask for your copy of bulletin No. 105 now.

A-81

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. . . *The Complete Boiler Control System*

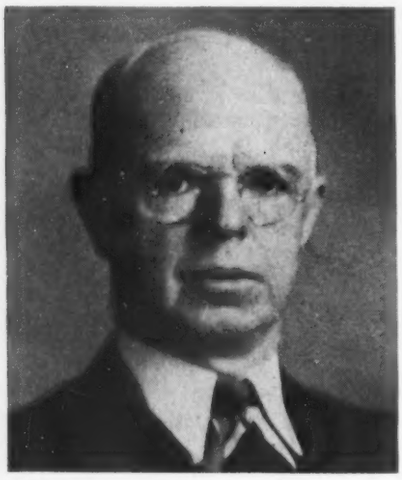
CONTROL • DESUPERHEAT CONTROL • COMBUSTION CONTROL • FEED WATER CONTROL

NEWS ABOUT PEOPLE

Carpenter Assigned New Duties in Pawtucket

Henry H. Carpenter has been appointed chief industrial service engineer of the Blackstone Valley Gas & Electric Co., Pawtucket, R. I., succeeding Lester H. Knapp, now vice-president. Mr. Carpenter joined the Stone & Webster organization upon being graduated from Harvard College in 1916 and had varied experience in several public utilities (with time out for army service in World War I) until 1924. In that year he became industrial service engineer of the Blackstone Valley company with headquarters at Woonsocket, covering the northern division of its activities and rising to the post of assistant chief industrial service engineer.

Arthur S. Kirk of the power sales staff of the Blackstone Valley Gas &



H. H. Carpenter

Electric Co., Woonsocket, R. I., has been named assistant chief industrial service engineer, succeeding H. H. Carpenter, whose promotion is announced above. Mr. Kirk was educated at Boston University, served in the U. S. Navy in the previous war and joined Stone & Webster at Boston in 1920. He was transferred to the Blackstone Valley company in 1925, and two years later was made industrial service engineer with headquarters at Woonsocket.

•

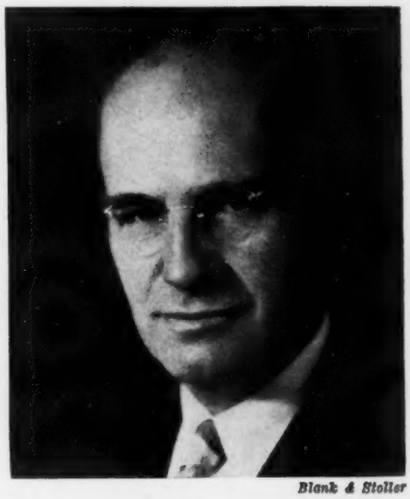
▶ WILLIAM L. COLLINS, vice-president of the Buffalo Niagara & Eastern Power Corp., has been appointed chairman of the Buffalo Council of Defense.

▶ WILLIAM M. RILEY, superintendent of the transformer and shops division, substations and shops department, Duquesne Light Co., Pittsburgh, has retired after 39 years of serving the company needs with respect to transformers. His entire life has been devoted to the operation, repair, improvement, and moving of the thousands of major units that make up the some 2,000,000 kva. of capacity on the Duquesne Light System. He joined the company in 1902, when he entered the service of the Allegheny County Light Co., having previously served with Westinghouse Electric & Manufacturing Co., on transformer work at East Pittsburgh.

▶ A. Y. WARNER, manager of the Rockville-Stafford district of the Connecticut Light & Power Co. since 1939, and previously manager of the Middletown district for six years, has resigned to join the Capewell Manufacturing Co., Hartford, Conn. He has been succeeded by ALFRED M. WADE, formerly supervisor of sales promotion for the C. L. & P. company. Mr. Wade is a graduate of Union College, Schenectady, N. Y. After working for Standard Oil he became advertising manager of the Adirondack Power & Light Co., and in 1924 entered the sales department of the C. L. & P. In 1928 he joined the staff of General Motors Co. and was in India for four years, on appointment as assistant sales manager for that country. He returned to the C. L. & P. company sales department in 1934.

R. B. Shepard Named Chief Electrical Engineer

Robert B. Shepard, head of Underwriters' Laboratories' electrical work since 1924, has been made chief electrical engineer through action of the executive committee of the board of trustees. The new title was created to



Blank & Stoller

make clear that Mr. Shepard's responsibility extends over all electrical department work, including that done at the New York, Chicago and San Francisco testing stations. Mr. Shepard is also senior resident engineer at the laboratories' New York office, which is the home office of the electrical department.

Mr. Shepard joined the laboratories' staff in 1913 as a factory inspector in Schenectady, N. Y. In 1917 he was made assistant electrical engineer in charge of the electrical work in the eastern part of the country. In 1922 he was promoted to the position of associate electrical engineer, and in 1924 was appointed electrical engineer and put in charge of all of Underwriters' Laboratories' electrical work.

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Contributed to this Statistical Issue of Electrical World by providing complete and lasting cable protection from the central station* to the statistical machines of industry.

* In addition to the usual outdoor services, Orangeburg Materials have also been installed in the floors of many business departments, office buildings and industrial plants.

ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

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STRENGTH to support the pole structure under maximum ice and wind loading . . . RUGGEDNESS to withstand the punishment incurred in construction and service . . . DURABILITY that outlasts the normal life of the line . . . are combined—with important ECONOMY—in *Crapo* Galvanized Steel Strand.

Each size and grade develops the full tensile strength of the steel in cross section. The heavy, ductile, tightly-bonded zinc coating—applied by the famous *Crapo* Galvanizing Process—provides lasting protection against corrosion.

There is a size and grade of *Crapo* Galvanized Steel Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write for further information!

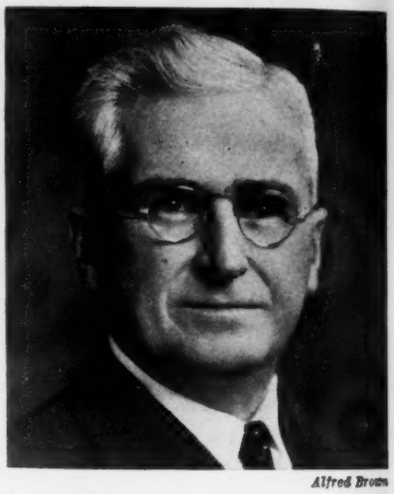
INDIANA STEEL & WIRE COMPANY . . . . . MUNCIE, INDIANA

Crapo GALVANIZED STEEL STRAND

New England Promotions Announced by G.E.

Robert W. Adams, manager of the central station department of the General Electric Co., Boston, has been appointed assistant district manager for New England, reporting to T. S. Knight, commercial vice-president and district manager for that territory. Robert W. Herrick, manager of the company's office at Providence, R. I., has been named manager of the central station department with headquarters at Boston. Donald E. Walch, central station sales representative with headquarters at Boston, has been appointed manager of the Providence office.

Mr. Adams is widely known in electrical circles in the northeast. His early career was occupied in work for the B. F. Sturtevant Co., Boston, and the D & W Fuse Co. of Providence, R. I. He joined the General Electric organization as a design engineer, and after serving in that capacity, then as a transformer specialist and salesman, became manager of the Providence office of the company in 1913. In 1928 he was transferred to Boston as district manager of the central station department. He is a recent chairman of the Boston section A.I.E.E., and is the inventor of a transmission line calculator bearing his name. He is a member of the American Association for the Advancement of Science.



Alfred Brown

R. W. Adams

Mr. Herrick entered G.E. employe in 1905. He was engaged in sales work at Boston and was assistant to Mr. Adams in covering the Essex County area on central station requirements. In 1918 Mr. Herrick was transferred to the Providence, R. I., office of the company and was occupied with both central station and industrial sales as the latter increased in importance. When Mr. Adams was transferred from the post of Providence manager to take charge

NOWHERE IS INSULATOR RELIABILITY MORE ESSENTIAL THAN ON THE "LIFE-LINES" OF DEFENSE INDUSTRIES.
THOMAS INSULATORS FAITHFULLY MAINTAIN THE CONTINUITY OF THIS SERVICE UNDER ALL CONDITIONS.

THOMAS INSULATORS

are backed by 68 years of manufacturing skill and experience. Built for the ultimate in insulator reliability and performance, our units incorporate all the refinements gained from constant research, experience, and engineering skill. Quality production is the reason they excell under all operating conditions. Let our service records "speak louder than words" and you will want to "Specify Thomas" for your high-line construction.

THOMAS No. 21243 { 10" Standard Design
15,000 lb. M. & E. Rating
5¾" Standard Spacing

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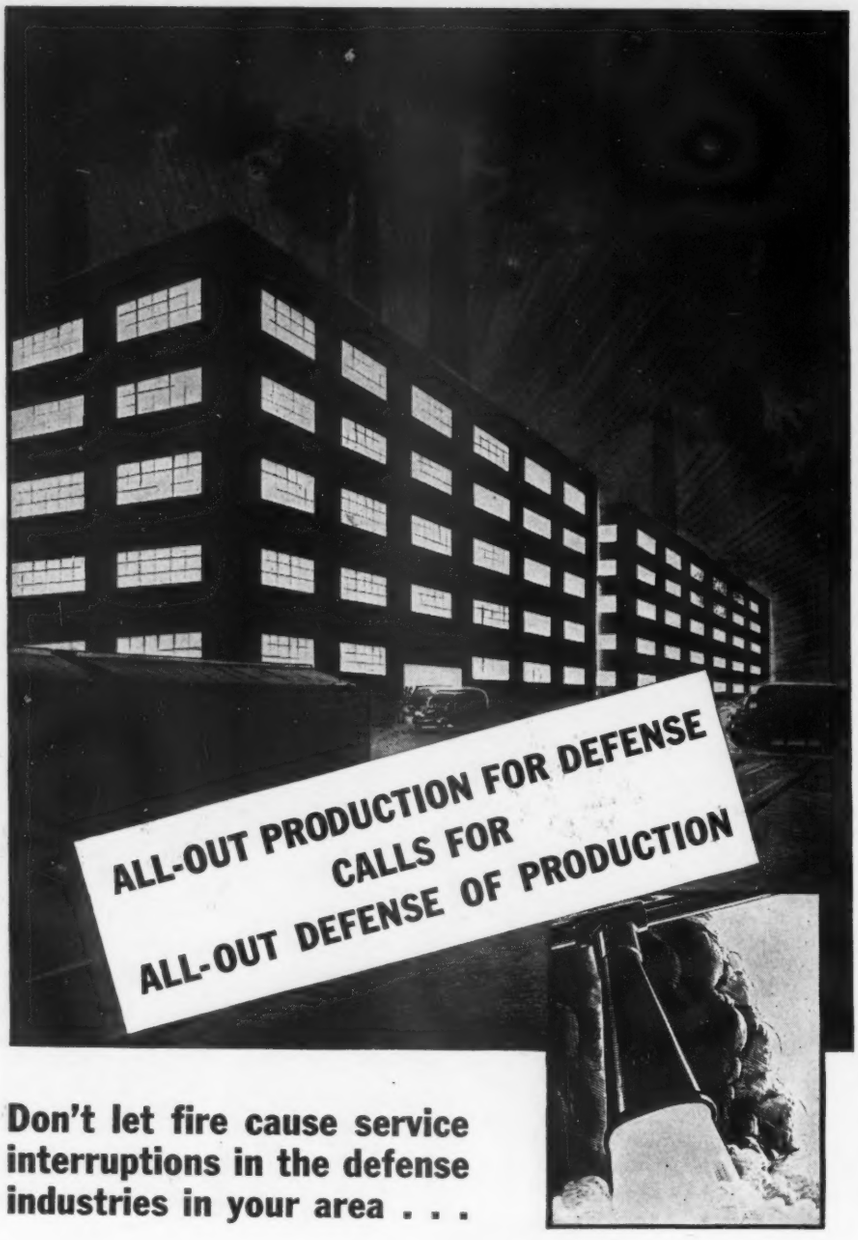

Don't let fire cause service interruptions in the defense industries in your area . . .

AMERICA HAS A JOB . . . to keep production rolling. Your part of that job is to keep delivering power—*uninterruptedly.*

One fire in a vital machine, at a vital time, can throw many factories in a single area completely out of gear. Central station and sub-station alike need carefully planned fire protection . . . ready to kill fire promptly . . . cut outage to a minimum . . . reduce damage to rock bottom.

You get these results with built-in LUX extinguishing systems. LUX strikes back at fire with split-second speed. Harmless LUX carbon dioxide gas kills fire instantly, without damaging equipment, windings or insulation. *LUX helps confine fire damage to point-of-rupture.*

When the slogan is "Speed! . . . and more speed!" the quick, heavy fire-fighting punch of LUX is essential. LUX can help you deliver power for defense . . . *power without interruption.*

LUX SNUFFS OUT FIRE

Walter Kidde & Company
Incorporated
1228 West Street, Bloomfield, N. J.

of the central station department at the New England district sales office in Boston in 1928 Mr. Herrick was appointed manager at Providence. He was made an honorary life member of the Rhode Island Electrical League before leaving for his new post.

Mr. Walch has been employed by the company at its Lynn plant and as an apparatus salesman in the Boston office has handled with distinction the Boston Edison Company's account for some years. He is active in A.I.E.E. affairs in New England and in engineering society work.

•

▶ HARRY J. MARTIN, Seattle manager of the National Carbon Co. from 1920 to 1934, and later Seattle representative of several eastern electrical manufacturers, has been named state director for Washington of the division of contract distribution of OPM.

▶ H. E. MERRILL, formerly advertising manager of the General Electric construction materials division, Bridgeport, Conn., is now product promotion manager with responsibility for the sales development of fluorescent devices for both the accessory equipment and the wiring devices sales sections. ANDREW DOREMUS, formerly assistant to Mr. Merrill, has been appointed construction materials advertising manager.

▶ FRED A. HUBBARD, New Bedford (Mass.) Gas & Edison Light Co., has been elected president of the Electric Lines Club (a New England central station specialist group of engineers and operating men). ARTHUR L. DAVIS, Western Massachusetts Companies, Greenfield, has been named vice-president, and ALEXANDER B. WHITEHOUSE, Lynn Gas & Electric Co., was re-elected secretary-treasurer.

▶ D. HAYES MURPHY, president of the Wiremold Corp., Hartford, Conn., has been appointed an assistant to Walter Whitney, Jr., deputy director of the control division of the OPM at Washington, D. C. Mr. Murphy's duties will relate to the certification of geographical sectors and localities adversely affected under priority regulations, in connection with the problems of small industries in particular.

▶ C. M. FIFE, manager Electric Home Bureau, West Penn Power Co., is the new chairman of the National Adequate Wiring Bureau's plan committee. He succeeds Herbert Metz, whose appointment as chairman of the executive committee was recently announced. Mr. Fife has been a member of the plan committee for more than a year. He

Power -

LEAPING TO THE TOUCH

SHRILL blasts of a whistle break the morning stillness . . . Workmen file through open gates . . . Shop doors swing wide . . . Lines of machines are poised for action . . . A button is pressed . . . A relay snaps . . . Giant switches crash shut . . . Wires are flooded with current . . . Motors turn . . . And industry starts!

A torrent of power for industry's needs which may have its source miles away, on a river that spins the runner of a hydraulic turbine, thus transforming water's energy into useful mechanical energy to lighten man's physical toil!

Priceless is our more than 64 years of experience gained by research, designing and fabricating hydraulic machinery—and valuable will it be to you, *if you place your power problem in our hands!*

"If It's Hydraulics Put It Up to Us"

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YORK, PENNSYLVANIA

POWER by SMITH

BIAS TAPES *with plenty of* STRETCH!

ACME bias tapes fit snugly around corners, into slots and over uneven surfaces because they have exceptional flexibility (stretch), and the tensile strength to stand the pull. These qualities are due to an Acme-developed process of applying pure vegetable oil varnishes of Acme formula to highest grade cotton fabric. Available in bias or straight tapes and rolls up to 36" wide—yellow or black. Samples if desired.

Acme Wire PRODUCTS

The Acme Wire Co., New Haven, Conn.
VARNISHED INSULATIONS—COILS—MAGNET WIRE

TWICE-TESTED . . . Individually Adjusted

There's a secret to making fine relays quite aside from sound design and the use of quality materials. This is summed up in just one word, "Care". Care, as we at Dunco see it, calls for painstaking inspection of individual parts before and during manufacture, a complete test of the finished unit, plus another final test which includes individual adjustment for the job it has been designed to fill.

In brief, Dunco's production objective is "Not only how many—but how well". This, we believe, is the big secret behind the widespread selection of Dunco Relays and Timers by leading users for applications where the call is for the utmost in dependability and durability. Catalog gladly sent on request.

DUNCO RELAYS and TIMING DEVICES
STRUTHERS DUNN, INC., 1319 Cherry Street, Philadelphia, Penna.

has been chiefly concerned with wiring problems during the eighteen years of his association with West Penn Co. and has been in direct charge of wiring promotion since 1930. He also had general responsiblity for relations with electrical contractors, inspection authorities, builders, etc. When the company later became interested in kitchen planning and demonstration homes Mr. Fife directed these promotions and became manager of the Electric Home Bureau, organized in 1938.

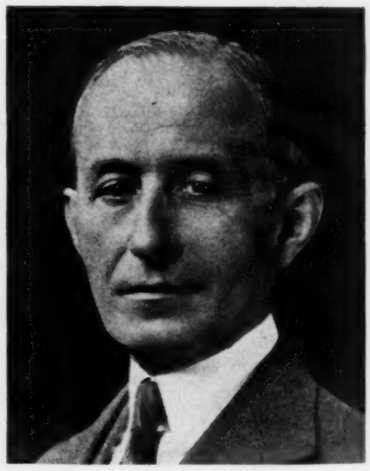
▶ HENRY B. BRYANS has been elected vice-president of the American Standards Association for the year 1942. Mr. Bryans is executive vice-president and director of the Philadelphia Electric Co.

OBITUARY

Philip Torchio

Philip Torchio, retired vice-president of the Consolidated Edison Co. of New York, Inc., died on January 14 at his home in Bronxville, N. Y.

Mr. Torchio was best known in the utility industry for the work he did in



the development of electricity in steam and water power generating stations and in the unification of systems of transmission and distribution over large territories. Mr. Torchio was born in Vercana, Como, Italy, in 1868, and received his engineering education in that country. Coming to this country, he become a draftsman for the Edison Electric Illuminating Co. of New York, Consolidated predecessor, in 1895, subsequently being made statistician, engineer of economics, engineer of distribution, chief electrical engineer, and in 1924 vice-president in charge of electrical engineering of New York Edison Co. He also acted as consulting engineer for other electric companies in what is now the Consolidated Edison System.

Water Conditioning at Chester STATION

PHILADELPHIA ELECTRIC COMPANY

Each of the Cochrane CARBITE Softeners (above) is equipped with a 3-inch single control valve. Note salt-storage and brine-measuring tanks in foreground.

The Cochrane Steam Sample Degasifier (center) separates non-condensable gases from the boiler steam for further gasometric analysis.

The specially designed Cochrane Deaerator measures 8 ft. in diameter and can deliver 1,310,000 lb. per hour of "zero-oxygen" water. Deaerator is shown in place during erection of station's new addition.

THE Cochrane Deaerator at Philadelphia Electric's Chester Station supplies "zero-oxygen" water to the high-pressure boilers for the new #5 and #6 turbines. The 25-ft.-high Deaerator storage tank is specially designed for variable pressure, operating in parallel with the existing constant pressure units. Variable water level in the Deaerator storage tank compensates for the changing Deaerator pressure and maintains proper head on the pumps supplying the high-pressure boilers through closed heaters and supplying low-pressure boilers at the same time.

Makeup to evaporators is supplied through a double-unit Cochrane CARBITE Zeolite Softener equipped with rotary-disc single control valves. Separate salt-storage and brine-measuring tanks are employed. Chester City water with 4 to 8 grains of hardness per gallon is treated by exchanging the hardness ions for sodium in the CARBITE beds. The two 5½-ft.-diameter softening units are each capable of softening 65,000 gallons of 8 grain water between regenerations.

COCHRANE CORPORATION • 3106 N. 17th ST. • PHILADELPHIA, PA.

COCHRANE PRODUCTION DIRECTLY FOR DEFENSE

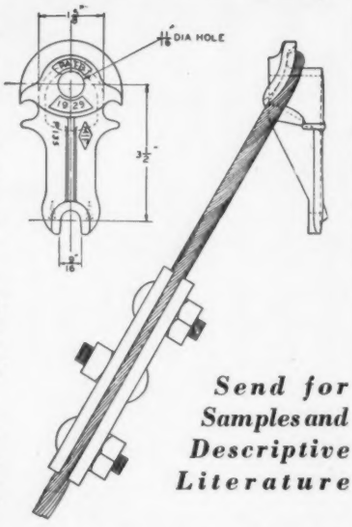
Deaerators for U.S. Navy and U.S. Maritime Commission Ships . . . by Cochrane Corporation, long-time specialists in the conditioning of boiler feedwater. One of a growing list of power-plant equipments developed primarily for National Defense . . .

Cochrane

SOFTENERS • DEAERATORS • FLOW METERS • STEAM SPECIALTIES

Now Past the 1,300,000-Mark

Increased demand for M. I. F. Through-bolt Guying Devices during 1941 brought total sales of Through-bolt Guy Hooks, typified by P135 illustrated above this figure. Simplified Guying Specifications, based on this Guy Hook with P143 Curved Ribbed Washer and P128 Thimbleless Eye Nut for Accessory Applications, are featured in a recently issued folder available on request. These units designed to develop safety factor over full rated strength of standard 5/8" Through-bolts.



Send for Samples and Descriptive Literature

These fittings may be advantageously used first where Through-bolt is already used to apply corner or dead-ending stresses to pole.

Test competitively with present guying specifications by sending assorted trial order at following 100-lot F. O. B. Branford prices:

P135 Guy Hook	$18.20/C
P128 Eye Nut	14.70/C
P143 Curved Washer	7.70/C
P126B Bolt Eye	24.50/C
PA-128-6 Anchor Rod (5/8"x6 ft. Thimbleless)	66.70/C

Or, we will send sample P135, P128, and P143 without charge or obligation in response to request on Operating Company letterhead.

Use the Guy Hook for anchor guys, and the Eye Nut or Bolt Eye for pole to pole and other relatively flat guys, and the Curved Washer to minimize slotting or splitting stresses in the pole. Larger sizes available for heavier service.

Misc. M. I. F. Pole Hardware Specialties: *— Williams Pole Mounts — Pole Stubbing Clamps—Aerial Cable Messenger Clamps and Insulated Hangers—Neutral and Ground Wire Clamps —Malleable Secondary Racks and Clevises — Tubular Pole Fittings — Transformer Hanger Plates for Through-bolt Mounting — Malleable Crossarm Gains — Screw Anchors — Sidewalk Guy Fixtures and Alley Arm Braces — Guy Strand Dispensing Holders — Through-bolts and Double-arming Bolts, etc.*

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Dept. [Factory and New England Sales Offices] **Branford, Connecticut**
New York Sales Office: Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto

Insulation Tests Simplified!

No more tiresome cranking of a hand driven generator

NEW STANDCO

B-5 MEGOHMER

Ranges: 0-200 Megohms
0-2000 Ohms
0-300 & 0-600 Volts DC

Steady test voltage of 500 volts DC instantly available, at the touch of a push button. Direct readings of insulation resistance obtained on special color-graded scale without any calculations.

● ***Write for New* BULLETIN 430**

for details of design and operation of this radically new instrument.

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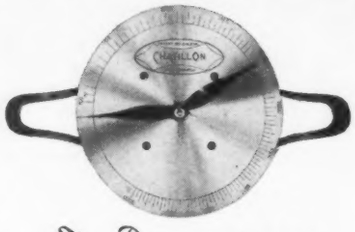
All kinds OF PRECISION SPRING DYNAMOMETERS



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Est. 1835

He retired from Consolidated Edison Co. in the summer of 1938.

Mr. Torchio held a number of patents here and abroad on various improvements in apparatus, cables, storage batteries and electrical control. During the first World War he was a consultant in developing with government representatives plans for the interchange of electric power between different electric companies along the Eastern Seaboard. He was also consultant for the Navy Department in the development of electrical cable for use in large electrically propelled battleships. Mr. Torchio had been president of the New York Electrical Society, fellow of the American Institute of Electrical Engineers and a member of the Franklin Institute, Illuminating Engineering Society and the Associazione Electtrotecnica Italiana.

•

Albert Lieberman

Albert Lieberman, president of the Southwestern Gas & Electric Co., suffered a stroke of apoplexy on January 16 in his Texarkana, Ark., office and died shortly after in a Texarkana hospital. Mr. Lieberman became associated with the Southwesern Gas & Electric Co. in 1926, when he became assistant to the president, directing the general management of the properties in that capacity. In 1928 he was elected vice-president and general manager and the following year president.

For ten years prior to joining Southwestern Gas Mr. Lieberman was identified with the Morrison and McCall interests of St. Louis, Mo., having charge of all their properties in Arkansas, Oklahoma and Missouri. He was born in Lafayette County, Mo., 56 years ago and for the past 38 years had been engaged in the utility business.

•

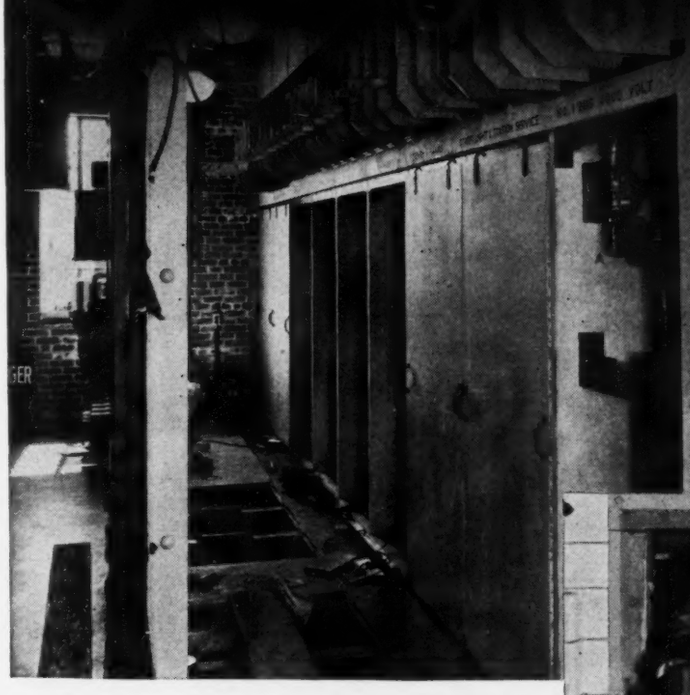
C. D. Flanigen

Cameron D. Flanigen, who retired as vice-president of the Georgia Power Co. in 1936, after 50 years of service, died at his home in Athens on January 8, at the age of 87.

A pioneer in the development of public utilities in Georgia, Mr. Flanigen entered the utility field as an employee of the Athens (Ga.) Gas Light Co. in 1883, remaining as manager until 1890. He then left the utility field, but returned in 1894 as superintendent of the Athens Railway & Electric Co., subsequently advancing to the presidency. Following the merger of the Athens properties with the Georgia Power Co. he became a vice-president of Georgia Power. Some years ago Mr. Flanigen served as president of the southeastern

FOR *LESS* MONEY...

MATERIALS



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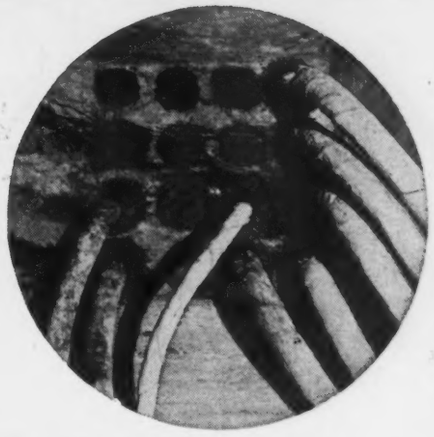
Check Trancell's advantages for cell structures and doors: Compared with metal, Trancell greatly reduces condensation troubles. An asbestos product, it cannot rust . . . never requires shutdowns for cleaning or painting. Being fireproof, it confines oil fires to the cells in which they occur, and its low heat conductivity minimizes damage to adjacent equipment. Compared with concrete, Trancell's light-weight sheets are easily, rapidly erected without water. Floor loading is minimized, permitting construction savings. Brochure D.S. 426 gives full details.



PERMANENT SEALS FOR DUCT OPENINGS

Easily worked and handled, Duxseal is a plastic, non-hardening putty that forms a lasting tight seal. Unaffected by temperature changes or liquids and gases commonly found in underground cableway structures. Adheres firmly to any duct or metal surface.

INCOMBUSTIBLE CABLE PROTECTION

Here's an unusually effective cable fireproofing with a long record of dependable service—J-M Niagrite-Asbestoment. It is easy to apply . . . shields cables from excessive heat . . . needs less maintenance. In case of arcing, it prevents damage to adjacent cables and equipment.

For details on how these J-M Electrical Products help you improve service and save money, address Johns-Manville, 22 East 40th Street, New York, N.Y.

ELECTRICAL PRODUCTS

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division of the National Electric Light Association and was active in the Athens Chamber of Commerce, the American Electric Railway Association and as a member of the Public Utilities Information Bureau of Georgia. He was born in Philadelphia and was graduated from the Polytechnic College of the state of Pennsylvania.

•

▶ FRED W. HERBERT, consulting accountant, died on January 7 in New York, at the age of 76. He had been ill for a month. Mr. Herbert was born at New Haven, Vt. Early in his career he was identified with the Denver Water Co. and the Denver Gas & Electric Co. and later with the Colorado Public Utilities Commission as chief statistician. Mr. Herbert was connected with the accounting national section of the old National Electric Light Association from 1920 to 1933, and upon its dissolution in the latter year he opened a New York office as a consulting accountant.

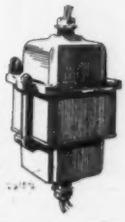
▶ LIEUT.-COL. GEORGE D. BABCOCK, director of engineering management of the Federal Works Agency and former management engineer of Rural Electrification Administration, died in Walter Reed Hospital, Washington, January 12. A native of Corinne, Utah, he was 66 years of age. Colonel Babcock pioneered in the field of scientific industrial management. Prior to becoming chief ordnance supply officer in World War I he was production management of the Franklin Manufacturing Company, which produced Franklin cars. From 1934 to 1937 he was with various federal works and relief agencies, before taking the REA assignment. He left that position in 1939 to join FWA.

▶ LIEUT.-COMMANDER WALTER D. LA MONT, U.S.N. retired, inventor of the "forced circulation" boiler, president of Steam Power, Inc., and W. D. La Mont, Inc., died on January 19, of a heart attack, at his home in New York. He was 52 years old. His outstanding work in engineering, particularly in the boiler manufacturing field, had long been recognized by the Navy, which in 1918 made him an engineering instructor at the Naval College in Annapolis. His inventions, however, are only now beginning to be placed in actual use in marine and other power construction in this country, although they have received wide recognition in Europe, particularly in Germany. He resigned from the Navy in 1924 to devote his time to steam boiler design, forming his own company. It was a forced circulation boiler that Combustion Engineering Corp. installed at the Somerset steam plant of the Montaup Electric Co.

AS THE ARCHITECT *PLANS* . . .

Above — AmerTran power transformers available for all requirements in sizes to 10,000 KVA., 132 KV.

Left — AmerTran distribution transformers of either oil or non-inflammable-liquid immersed type available in sizes to 500 KVA., 72 KV.



Right — AmerTran air-cooled transformers for either indoor or outdoor service are available for all industrial requirements— sizes to 150 KVA.

PLANNED, designed and constructed to withstand safely every stress and load of a specified service . . . this is how modern steel structures (bridges, for example) are created, and likewise this typifies the manner in which AmerTran Transformers are produced. Our transformers are not all of one basic type which is modified to meet varying requirements of voltage and capacity. Instead we have developed what is probably the most diversified line of transformers offered by any single manufacturer, including many distinctly different types, each for a specified type of service and each available in a wide range of ratings. In other words, we are prepared to furnish transformers to meet your specifications exactly and to render dependable service under all conditions of operation. Let us recommend transformers for your requirements.

AMERICAN TRANSFORMER CO., 178 Emmet St., Newark, N. J.

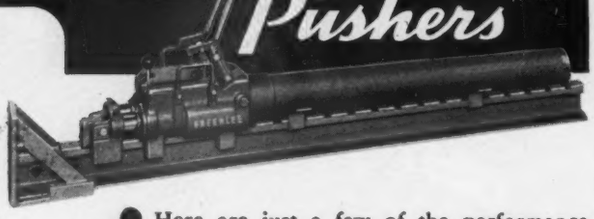
Manufactured Since 1901 at Newark, N. J.

AMERTRAN

Built to your Specifications

LAY PIPE *Twice* AS FAST with *Greenlee* Hydraulic Pushers

Here's Proof!



- ✓ 2½-inch pipe pushed 165 feet under Michigan Blvd., Chicago, in 9 hours. Pushed from 3rd sub-basement.
- ✓ 3-inch pipe pushed 130 feet in dry hard soil under concrete pavement in 11 hours.
- ✓ 23,800 feet of 1½" galvanized iron conduit installed for fire alarm raceway under concrete streets in less than ten weeks.
- ✓ Only 2 hours to push 3-inch pipe 60 feet in rocky filled-in soil under concrete highway.

These performance records taken from letters and information voluntarily sent in by users.

● Here are just a few of the performance records of the Greenlee Hydraulic Pipe Pusher . . . each one proof that the Greenlee Pusher is the fastest and most economical way to lay pipe. These pushes were all made with only one or two men pumping the handles. On each of these jobs the time saved over other methods was more than 50%. There's no extensive trenching, no pavement cutting, no tunneling, no backfilling, no repaving. Only a short trench is dug to accommodate the pusher and pipe. Easy to carry to the job and set up because they're compactly built into one unit . . . no extra equipment needed. Write today for information about the No. 790 Pusher for 1¼ to 4-inch pipe or the No. 795 for large drainage ducts and pipe beyond 4 inches.

Send for PUSHER BULLETIN S-117

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FOR UTILITIES, MOTOR REPAIRMEN, MAINTENANCE MEN, ELECTRICIANS AND CONTRACTORS. . .

The UTILITY TESTER is ideal for either bench or field work. A specially designed cover attached in a jiffy insures complete portability. Operates on a self-contained battery. Size 9½" x 11" x 6½".

The New UTILITY TESTER

measures —

Ohms, Watts, Volts, Amperes

Both A. C. and D. C.

The first instrument of its kind ever made, the UTILITY TESTER enables *every* possible measurement necessary to service *any* electrical appliance or utility.

SPECIFICATIONS

6 VOLTAGE RANGES: (A.C. and D.C.)
0 to 1 Volt. 0 to 10 Volts, 0 to 50 Volts, 0 to 100 Volts, 0 to 500 Volts, 0 to 1000 Volts.
4 CURRENT RANGES: (A.C. and D.C.)
0 to 1 Amp., 0 to 10 Amps., 0 to 50 Amps., 0 to 100 Amps.
2 RESISTANCE RANGES:
0 to 300 Ohms, 0 to 3000 Ohms.

The UTILITY TESTER reads all resistances commonly used in electrical appliances and motors, and in addition reads extremely low resistances. For instance, 1½ ohm appears on the center of the Low Ohms scale and resistances as low as 1/50th of an ohm are easily read.

EXTRA ADDED FEATURE

Because of its unique circuit arrangement, the UTILITY TESTER enables wattage consumption measurements irrespective of the line voltage. 3 Wattage Ranges: (A.C. and D.C.) 0 to 100 Watts, 0 to 1000 Watts, 0 to 5000 Watts.
The Wattage reading is based on the unity factor and is subject to power factor correction when used on inductive or capacitive loads.

The UTILITY TESTER comes complete with portable cover, self-contained battery, test leads and all necessary instructions. Shipping weight 11 pounds. Only **$12.85**

SUPERIOR INSTRUMENTS CO. 227 FULTON STREET DEPT. E.W., NEW YORK, N. Y.

Sales Opportunities

ASHDOWN, ARK.—Southwestern Gas & Electric Co., Shreveport, La., has approved plans for new 132,000-volt transmission line from point near Texarkana, Tex., to new terminal switching station to be constructed on site about 16 miles north of Ashdown, where property has been selected, a total distance of approximately 37 miles. Cost estimated close to $350,000. Permission has been secured and work is scheduled to begin soon. Arkansas Power & Light Co., Pine Bluff, Ark., has made application for authority to build new transmission line of similar voltage from terminal station noted, where connection will be made with high-tension system of Southwestern company, to point near aluminum works at Lake Catherine, vicinity of Malvern, Ark., to be constructed by Defense Plant Corporation, Washington, D. C., a federal agency, at estimated cost of $33,000,000, and operated by Aluminum Co. of America, Inc., Gulf Building, Pittsburgh, Pa. Power supply will be furnished for operation of aluminum plant by two utility companies mentioned, forming part of new power pool in that area to be developed for such service, and in which a number of cooperative electric associations, under direction of REA, will participate.

PITTSBURGH, PA.—United States Engineer Office, New Post Office Building, receives bids until February 3 for lock-operating machinery for Emsworth Locks, Ohio River, including gate- operating machinery for 110-ft. lock and for 56-ft. lock, respectively, transmission equipment, automatic turbine control, accumulator, accumulator control valve, automatic by-pass, gate and valve controls, and 2- and 3-in. control valves (Circular 370).

HATBORO, PA.—Brewster Aeronautical Corp., 34-01 Thirty-eighth Avenue, Long Island City, New York, N. Y., manufacturer of airplanes and parts, plans installation of motors and controls, switchgear, transformers and accessories, duct lines, fluorescent lighting system, electric hoists, electric cranes, conveyors and other equipment in new one-story addition to branch plant at Hatboro, totaling about 300,000 sq. ft. of floor space, to be used for expansion in assembling division for large bomber-type planes for government. Cost estimated about $1,500,000, with fund to be provided by Defense Plant Corporation, Washington, D. C., federal agency. Work will be placed under way at early date. Silverman & Levy, Architects' Bldg., Philadelphia, Pa., are architects.

SUPERIOR, WIS.—Superior Water, Light & Power Co., Superior, has plans maturing for addition to local Winslow steam-electric generating station, with installation of equipment for increased capacity. Cost reported over $1,400,000. Financing is being arranged and work will be placed under way soon. Ebasco Services, Inc., 2 Rector Street, New York, N. Y., is consulting engineer.

LOCUST GROVE, OKLA.—United States Engineer Office, Wright Bldg., Tulsa, Okla., has plans under way for new power and flood control dam on Grand River at Markham Ferry, vicinity of Locust Grove. Hydroelectric generating station will be installed, with capacity and other details now being determined. Surveys for dam construction are nearing completion and bids are scheduled to be asked soon. Entire project is estimated to cost about $14,000,000 and initial appropriation of $1,500,000 has been made available.

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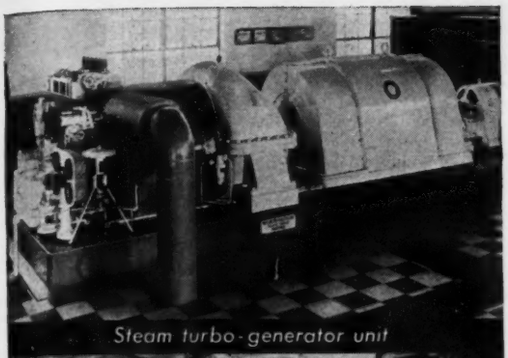
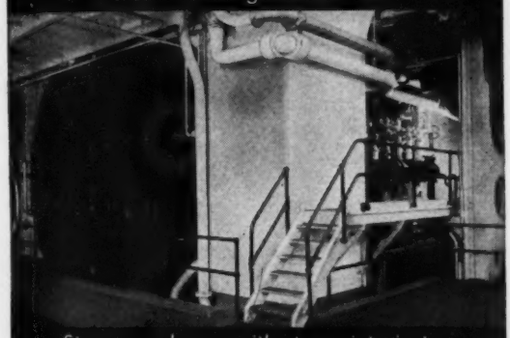
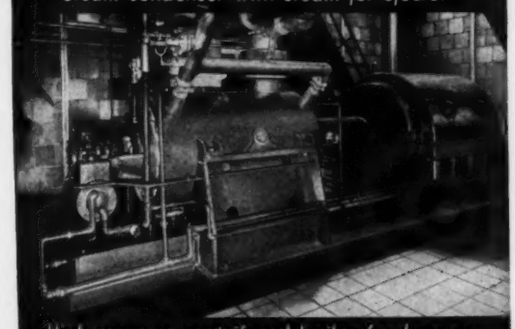


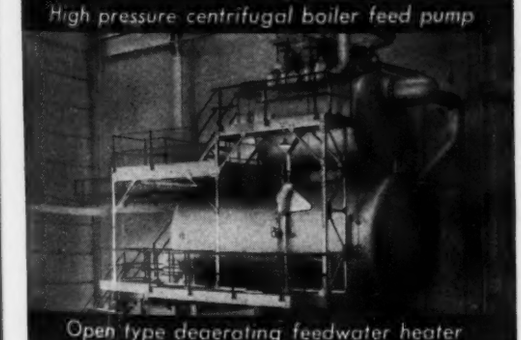
Steam turbo-generator unit



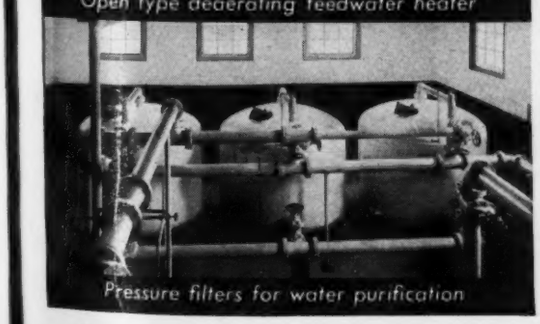
Steam condenser with steam-jet ejector



High pressure centrifugal boiler feed pump



Open type deaerating feedwater heater



Pressure filters for water purification

A WORTHINGTON RESPONSIBILITY

WORTHINGTON products are basic necessities for steam power plant operation in time of peace. The importance of the reliable performance of these products, and the demand for their production, are now many times increased because our country is at war.

Practically the entire output of Worthington's five plants flows directly into the war production program . . . for the Army, Navy, and Maritime Commission, or as essential equipment for the utility power, munitions, steel, petroleum, chemical and other key industries.

Army and Navy bases and airports depend largely on the reliable and continuous performance of equipment in utility power plants. Our utilities supply also power and light, water and sanitation services, all vital to the life of our cities and towns and to the many new housing concentrations for men and women engaged in war work.

Worthington, with its direct participation in many essential divisions of the war program, continues with its service to the public utilities . . . its ability to serve made possible by having maintained, through past years of depression as well as prosperity, an organization which has always contributed importantly to meeting the nation's needs.

STEAM TURBO-GENERATOR UNITS • MULTI-STAGE STEAM TURBINES • SINGLE-STAGE STEAM TURBINES COMBINED STEAM TURBINE and REDUCING GEAR UNITS • REDUCING and INCREASING GEARS • STEAM CONDENSERS • STEAM-JET EJECTORS • CENTRIFUGAL BOILER FEED PUMPS • WATER SOFTENERS and FILTERS • FEEDWATER HEATERS and DEAERATORS • REFRIGERATING and AIR CONDITIONING EQUIPMENT AIR AND GAS COMPRESSORS • TURBINE WELL PUMPS • STEAM, POWER and ROTARY PUMPS • CENTRIFUGAL GENERAL SERVICE PUMPS • DIESEL ENGINES • GAS ENGINES • CONVERTIBLE GAS-DIESEL ENGINES MULTI-V-BELT DRIVES • LIQUID METERS • PORTABLE COMPRESSORS and CONSTRUCTION AIR TOOLS

WORTHINGTON PUMP AND MACHINERY CORPORATION

MI2-3

General Offices: HARRISON, NEW JERSEY

WORTHINGTON

How well a connector is made is quickly proven when a lineman starts to use it.

The ease with which the nut is removed from the body, perfect mating of nut and body threads, absolutely no cross threading, and wide flats for holding and tightening fully prove the value of good machining of L-M Connectors.

Most important, with L-M Connectors, the lineman does not have to use great force to get high pressure contact between conductors — another feature which results from careful machining and is a big help to the man on the pole.

LINE MATERIAL CO.
MILWAUKEE, WIS.

BREMERTON, WASH.—Bonneville Power Administration, Department of Interior, Guardian Bldg., Portland, Ore., has authorized new 115,000-volt transmission line from Potlatch, Wash., to Bremerton, about 33 miles, for service at latter place. At Potlatch, new line will interconnect with high-tension line to Tacoma, Wash., with switching facilities to be provided at first noted point. Cost about $450,000

LAS VEGAS, NEV.—Manganese Ore Co., Inc., subsidiary of M. A. Hanna Co., Leader Bldg., Cleveland, Ohio, plans installation of heavy-duty motors and controls, generator set, transformers and accessories, switchgear, duct lines, exterior and interior lighting system, electric hoists, loaders, conveyors and other equipment in new mill in vicinity of Las Vegas for processing manganese ores for blast furnace use for government. Plant will comprise a series of buildings for main concentrating mill, to be equipped to handle about 1,000 tons of crude ore daily, with power substation for central station service, boiler house, electric-operated pumping station, machine and mechanical shops, and auxiliary structures. Company also will develop manganese ore properties in vicinity of new mill and will install machinery for that purpose. Entire project will cost about $4,500,000, and fund in that amount will be furnished by Defense Plant Corporation, Washington, D. C., federal agency. M. C. Lake, 71 New Montgomery Street, San Francisco, Calif., is vice-president and company geologist; R. S. Walker, Cleveland address noted, is consulting engineer.

NORFOLK, VA.—Virginia Electric & Power Co., Richmond, Va., will begin work soon on superstructure for addition to steam-electric generating station on Reeves Avenue, Norfolk, where expansion will be carried out for increased capacity. No estimate of cost announced. Stone & Webster Engineering Corp., 49 Federal Street, Boston, is consulting engineer.

STROMSBURG, NEB.—City Electric Department will begin work soon on extensions in primary and secondary lines for expansion in rural electric service in Polk County. Permission has been granted.

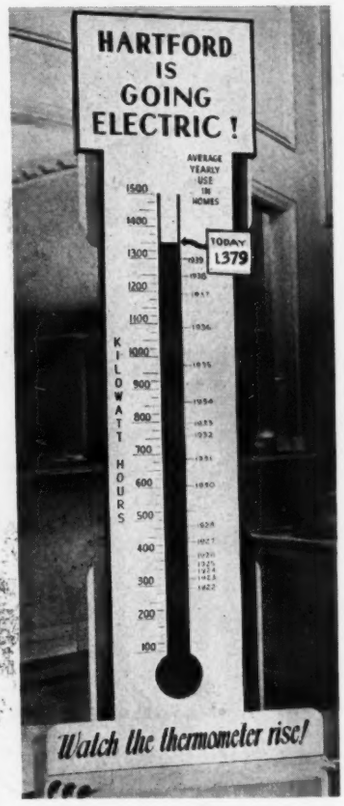
BEAUMONT, TEX.—Magnolia Petroleum Co., Magnolia Bldg., Dallas, Tex., plans installation of motors and controls, switchgear, transformers and accessories, duct lines, exterior and interior lighting systems, electric pumping machinery and other equipment in connection with expansion in oil refining plants for production of high octane gasoline for aviation service for government, with primary development to be carried out at main refinery at Beaumont. Company will increase present capacity of about 3,000 bbl. per day to 12,000 bbl. daily. Cost estimated approximately $15,000,000, of which $4,500,000 will be provided by Defense Plant Corporation, Washington, D. C., federal agency. Work will be carried out over a period of months and is scheduled to begin at early date.

LOUISVILLE, KY.—Louisville Gas & Electric Co. is arranging fund of over $3,500,000 for monthly expenditures, estimated at $500,000 per month, for expansion in plants and system during 1942, including completion of new steam-electric generating station now in course of construction at Paddy's Run on Ohio River, extensions in transmission and distributing lines, power substation units for several large industrial plants now being constructed where service will be furnished, and other operating facilities.

20 YEARS OF PROGRESS

Average USE in Homes 392% Up!

Average RATE in Homes 66% Down!



THE HARTFORD ELECTRIC LIGHT COMPANY

REA Allots Funds; Contracts Approved

Recent allotments announced by the Rural Electrification Administration, amounting to $2,958,000, bring the total since its inception to $434,974,321, of which $66,146,700 represents operations during the current fiscal year.

Details are as follows:

INDIANA—Utilities District of Western Indiana Rural Electric Membership Corp., Bloomfield, $370,000 for construction of a generating plant.

LOUISIANA—Ark-La Electric Cooperative, Inc., Homer, $2,500,000 to construct a power line to transmit power from Grand River Dam to the aluminum plant now being constructed at Lake Catherine, Ark.

NEBRASKA—Eastern Nebraska Public Power District, Syracuse, $88,000 for constructing power lines.

Construction contracts recently approved include the following:

GEORGIA—Jackson Electric Membership Corp., Jefferson, Robert J. Kelly, supt., and J. B. McCrary Engineering Corp., 1408-22 Marietta St. Bldg., Atlanta, Ga., engineer, contract to Montgomery Electric Co., 110-112 N. Perry St., Montgomery, Ala., 167 miles of line, 468 members; bid, $110,615.

ILLINOIS—Edgar Electric Cooperative Assn., Paris, Wallace L. Walker, supt., and Stanley Engineering Co., Muscatine, Iowa, engineer, contract to White City Electric Co., 569 West Van Buren St., Chicago, Ill., 291.3 miles of line, 554 members; bid, $220,957.

IOWA—Franklin Rural Electric Cooperative, Hampton, James Morrow, supt., and Buell and Winter Engineering Co., 508 Insurance Exchange Bldg., Sioux City, Iowa, engineer, contract to Sandberg and Johnston Construction Co., Hampton, Iowa, 91 miles of line, 186 members; bid, $65,378.

KENTUCKY—South Kentucky Rural Electric Cooperative Corp., Somerset, F. D. Gregory, supt., and Pat M. Sullivan, Gallatin, Tenn., engineer, contract to W. A. Smith, 215 Heyburn Bldg., Louisville, Ky., 333 miles of line, 801 members; bid, $285,738.

MISSISSIPPI—Capitol Electric Power Assn., Clinton, Earl L. Phillips, supt., and H. B. Gieb and Associates, 1207 Texas Bank Bldg., Dallas, Tex., engineer, contract to Stuart C. Irby Co., Jackson, Miss., 95 miles of line, 183 members; bid, $57,687.

MISSOURI—Cuivre River Electric Cooperative, Inc., Troy, Michael Drazen and Associates, 4903 Delmar Blvd., St. Louis, Mo., engineer, contract to Miller-Baxter Co., Inc., 445 N. Pennsylvania St., Indianapolis, Ind., 465.5 miles of line, 698 members; bid, $343,734.

PENNSYLVANIA—Central Rural Electric Cooperative Assn., Inc., Clearfield, L. H. Altenburg, supt., and Gibbs and Hill, Inc., 600 N. Second St., Harrisburg, Pa., engineer, contract to D and W Construction Co., 2119 Cleveland Ave., Columbus, Ohio, 131.45 miles of line, 462 members; bid, $117,443. Adams Electric Cooperative, Inc., Gettysburg, Calvin A. Cluck, supt., and Gibbs and Hill, Inc., Harrisburg, Pa., engineer, contract to Miller Construction Co., Inc., 1955 Martindale Ave., Indianapolis, Ind., 408 miles of line, 964 members; bid, $349,842.

TENNESSEE—Tri-County Electric Membership Corp., Lafayette, Will H. Sullivan,

PERMATOX "A"

Clean, Highly Toxic, Penetrating, Non-Bleeding, Non-Conductive, Oil Preservative.

This simple, effective treatment (5% pentachlorphenol + light fuel oil) offers a definite economy to industrial concerns and public utilities by insuring greatly prolonged service life for

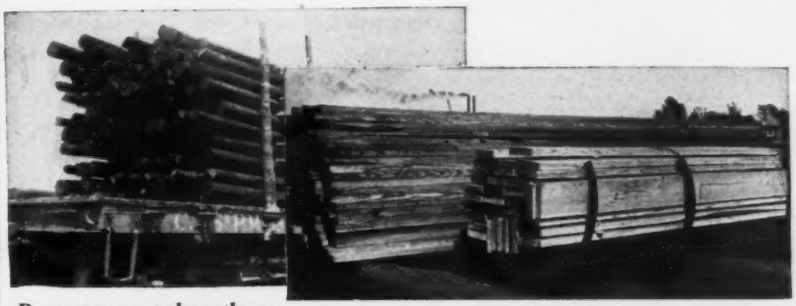
POLES .. LUMBER AND CROSS-ARMS

FOR *CEDAR* Poles . . . a thorough soaking treatment gives adequate absorptions and protects the pole from "shell rot".

For Southern *PINE* and *DOUGLAS FIR* Poles . . . pressure-treated with this clean oil solution, using same absorptions as for coal tar creosote. Result: A dry, clean, paintable, non-bleeding, deeply penetrated product.

For *FIR* Cross-arms . . . soaking in PERMATOX "A" insures the deposition of the toxic pentachlorphenol in the vulnerable area around the pin holes.

Ask for PERMATOX Bulletin 41-D



Permatox-treated southern pine poles en route.

Lumber ready to treat shown in foreground and Permatox-treated lumber in background.

A. D. CHAPMAN & COMPANY, INC.
Chicago, Illinois Portland, Oregon New Orleans, Louisiana

ELECTRITE
A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

DENSITE
An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

Pulp Products Department
WEST VIRGINIA PULP & PAPER COMPANY

"Cope"

UNDERGROUND EQUIPMENT

It's the Name behind the Product that counts

For a period of over fifty years "COPE" has stood for quality in workmanship and design. We have pioneered many of the features in cable installation equipment which today have become standard in most of the principal Telephone Companies, Central Stations and Municipal Plants throughout the country.

WRITE FOR CATALOG

T. J. COPE, INC.
6120-6122 VINE STREET
PHILADELPHIA, PA.

supt., and Pat M. Sullivan, Gallatin, Tenn., engineer, contract to R. H. Bouligny, Inc., 433 W. Morehead St., Charlotte, N. C., 95.5 miles of line, 348 members; bid, $78,982.

TEXAS—Victoria County Electric Cooperative Co., Victoria, S. W. Lanham, supt., and Beavers and Lodal, Smith-Young Tower, San Antonio, Tex., engineer, contract to Taylor Construction Co., P. O. Box 648, Taylor, Tex., 100 miles of line, 177 members; bid, $54,857.

VIRGINIA—Tri-County Electric Cooperative, Leesburg, J. A. Johnston, supt., and B. O. Vannort, 109 W. Third St., Charlotte, N. C., engineer, contract to Rockingham Construction Co., Inc., Harrisonburg, Va., 97 miles of line, 190 members; bid, $76,946.

WYOMING—Carbon Power and Light Co., Saratoga, Walter W. Flora, 1618 Russell, Cheyenne, Wyo., engineer, contract to R. N. Campsey, 2520 Layden St., Denver, Col., 45.3 miles of line, 3 members; bid, $36,800.

•

Phelps Dodge Makes Tin Substitute

Phelps Dodge Copper Products Corp. has announced increased production in a metal that will effect a substantial saving in the use of tin. This product, known as P-M-G Hardener, can be used in place of tin in the production of bronze castings, and is manufactured in the United States exclusively by Phelps Dodge Copper Products Corp.

In discussing this product, Wylie Brown, president of the corporation, said P-M-G Hardener is now being used by the Navy Department and by private shipbuilding companies in very large tonnages. When this product is alloyed with copper in the proper proportions a bronze is produced that is superior in physical and chemical properties to the regular tin bronzes, according to Mr. Brown. "Substantial savings in tin can be effected," Mr. Brown said, "if the Government will prohibit the use of tin in bronze castings such as Composition G and Composition M. These two compositions require between 8 percent and 10 percent of tin in the mixture. The use of P-M-G Hardener in these compositions will not only conserve tin but produce a bronze casting superior in quality and at no greater cost."

•

Plans to Expand Plant

Davis-Jones Wire Co., Pawtucket, R. I., affiliated with the Royal Electric Co., manufacturer of electrical wires, cables, fuses, etc., has filed plans for erection of three one-story additions, 81 x 170 ft., 38 x 66 ft. and about 41 x 50 ft., and will equip for expansion. Construction will be carried out at once. Total cost is reported at more than $75,000, with equipment.

QUIT STABBING POLES

● Use the new Multipoint Cant Hook. Its 6 points, ¼ in. x ½ in. in size, hold better than a single long point. Leave no deep stab holes where water collects and rot starts—do not damage the creosote treatment. The Multipoint Cant Hook grips more securely even the smallest diameter poles which are so difficult to handle with the standard single point hook—spreads strain over wider area—is self-releasing. Furnished in 3 sizes for handling poles up to 22 inches in diameter. Multipoint speeds up pole handling in the yard—eliminates damage—saves time and money. Made by the American Fork & Hoe Company, Cleveland, Ohio.

STURDETOOLS
a TRUE TEMPER PRODUCT

STURDETOOLS
MULTIPOINT CANT HOOK
6 points ¼"x½" in size grip the pole securely but leave no deep hole to encourage rot and decay.
Furnished in small, medium and large sizes for handling poles up to 22" in diameter. Prices and complete description on request.

Distributed by
JOSLYN MFG. AND SUPPLY CO.
Executive Offices
20 North Wacker Drive • Chicago, Illinois
Branches and Warehouses with Complete Stocks in Principal Cities of the United States

If we're only 3/5 right

here's the best fluorescent buy

YOU'RE interested, we take it, in getting your client the most light for the least money in the long run.

We say Hygrade Fluorescent Lamps give you that for five reasons:

Because of finer coating texture, which you can see for yourself;

Because Hygrade Fluorescent Lamps give *more light*—more lumens per watt;

Because they are *more even in color*—every lamp alike, also obvious to the eye—and an assurance of uniformly high quality;

Because Hygrade lamps are *"bright to the last inch"*—early end-darkening no longer cuts down the light-casting length of the lamp;

Because Hygrade lamps *last longer;* tests show demonstrably more life than others; ask Hygrade users and see what they say.

If this were so on only three of these points, or even two, your customer will be money ahead, better off, because he'll get *more light and better light than he can get elsewhere.*

But plenty of Hygrade Fluorescent users say we're right on all five points.

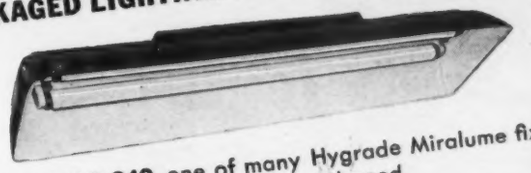
Especially those using Hygrade Packaged Lighting—complete, guaranteed fixtures with all elements unit-engineered to work together—know the superior quality of Hygrade lighting.

That is "fluorescent at its finest"—*better* lamps in *better* fixtures kept performing at their peak by *better* accessories.

So you'll find it pays to specify Hygrade when you recommend fluorescent lighting. Your client will be getting the best there is—and not a little of the credit will be reflected on you.

If you haven't yet received our free file-size kit—containing catalogs, prices and complete technical specifications on all Hygrade Fluorescent Lighting Equipment—write for it today. Dept. EW-1.

PACKAGED LIGHTING THAT'S UNIT ENGINEERED



MIRALUME F-240, one of many Hygrade Miralume fixtures for every industrial need.

Good lamps are the heart of good fluorescent lighting. But good HYGRADE lamps are at their best in this Packaged Lighting that is *engineered as a unit.* Lamp, fixture, starter and ballast are designed and built *to work together,* all held to uniformly high standards—there are no "weak spots" anywhere to limit the performance of any part.

HYGRADE SYLVANIA CORPORATION

SALEM, MASS.

Also makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes

All the power you need!

for a majority of air-compressor work!

***Here's why* you'll always be glad you bought a SMITH**

1. Low initial cost, operating cost and maintenance. (Model 100—60 cu. ft. size—uses only one gallon of gasoline an hour.)
2. Repairs and parts available at Ford garages everywhere.
3. Lightweight, easy to handle. (May be towed at permissible truck speeds.)
4. Capacity easily varied for different jobs.
5. The ruggedness and efficiency of these famous compressors are a source of constant satisfaction to users.
6. Automatic unloading and idling; self-starter.
7. No couplings, belt, clutch or gears to cause trouble.
8. Standard, quality parts.

★ SMITH COMPRESSORS are saving money for companies the country over. Consider the savings you'll enjoy with their use! BIG savings in purchase cost over standard compressors of equal capacity . . . important savings on upkeep, too! Made with FORD Motors and standard parts—that means dependability and economy.

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free Booklet

GORDON SMITH & CO.

INCORPORATED

495 College St. Bowling Green, Ky.

★ Smith ★

AIR COMPRESSORS

LETTER TO THE EDITOR

Transformer Protection

In my article "Transformer Protection Timed for Secondary Faults," in your December 13, 1941, issue, my attention has been drawn to an error on page 84 (1884). The statement that the percent impedance is equal to the percent drop at unity power factor is not correct.

To determine the percent reactance of a transformer, the percent regulation and the watts copper loss being given, the percent resistance is first determined from the copper loss by the formula

$$\%R = \frac{I^2R}{\text{KVA.}(10)}$$

where $\%R$ = percent resistance, I^2R is the watts copper loss and KVA is the transformer capacity. Then

$$\%D = \frac{(\%\ \text{Reg.})\ (100)}{100 + \%\ \text{Reg.}}$$ where $\%D$ = percent drop and % Reg. = percent regulation.

And $\%D = \%R \cos\theta + \%X \sin\theta$, approximately, where θ is the power-factor angle. Since the percent regulation is usually given at 80 percent power factor,

$$\%D(\text{at } 80\%\ \text{P.F.}) = \%R(0.8) + \%X(0.6)$$

and

$$\%X = \frac{\%D(\text{at } 80\%\ \text{P.F.}) - \%R(0.8)}{(0.6)}$$

The above is approximate. If the percent impedance value is furnished by the manufacturer, the more accurate method of finding the percent reactance of course is to take the square root of the difference of the squares of the impedance and the resistance percentages.

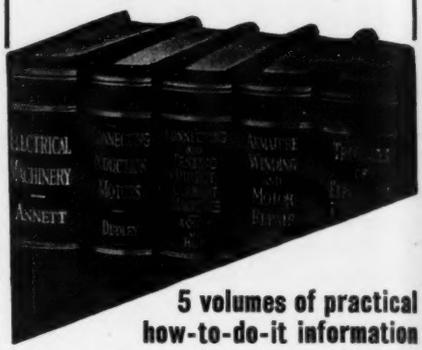
BRUCE O. WAKINS, Head
Operating Problems Unit,
Technical Standards Division,
Rural Electrification Administration
Washington, D. C.

•

Canadian Output Rises

Canadian central electric stations produced 3,183,982,000 kw.-hr. in November, compared with 3,140,317,000 kw.-hr. in October and 2,524,860,000 kw.-hr. in November, 1940, the Dominion Bureau of Statistics reports. Output during the eleven months ended November, 1941, amounted to 30,224,560,000 kw.-hr., compared with 27,495,907,000 kw.-hr. in the similar period of 1940.

Every phase of electrical maintenance and repair work covered in this Library



5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench of a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

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330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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(Books sent on approval in U. S. and Canada only.)

Down by the mill...

triple corrosion-protection

If you plan to install strand in a corrosive industrial atmosphere, there is no need to go to the expense of non-ferrous material.

Simply specify bethanized "B" or "C" coated strand, depending on how severe corrosion conditions are.

Bethanized B-coated strand has a zinc coating *twice* as heavy as required for standard Extra Galvanizing. Bethanized C-coated strand has a zinc coating *three times* as heavy.

A.S.T.M. tests clearly indicate that the life of a zinc coating is directly proportional to its weight. This means you can expect double life from a bethanized "B" coating, triple life from a "C".

Because a bethanized coating is put on by electricity it is the purest, tightest, most uniform zinc armor ever applied to strand wire. No thin spots. No flaking when the strand is spliced or strained in erection or service.

Bethanized strand is available in all strengths —Standard, Siemens Martin, High Strength, Extra High Strength and Specification. Use it on your next installation and match coating weight to the corrosiveness of the atmosphere.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

To the non-technical buyer, one make of Fluorescent equipment may look so much like the others that he can only *guess* which is the RIGHT one to choose. As a result, many an inferior fixture has been selected just because it "cost a little less."

But gradually, as utilities and architects spread the facts, more and more business men realized that the *real bargain* in Fluorescent lighting is the BEST ENGINEERED JOB. That is why so many leading firms are now insisting on LINOLITE—the equipment that is *Engineered for Performance* and *Guaranteed for Satisfaction* by FRINK, pioneers in Fluorescent lighting and leading manufacturers of lighting equipment since 1857.

Mail the coupon below for our new brochure of Frink installations and valuable Fluorescent engineering data. It shows why it pays to

"DO IT **RIGHT** WITH
LINOLITE"

The FRINK Corporation
and subsidiaries
Barkon-Frink Tube Lighting Corp.
Sterling Bronze Company

THE FRINK CORP.
Bridge Plaza South,
Long Island City, N. Y.

Please send me your new brochure on "The Ultimate in Fluorescent Lighting."

NAME .....
ADDRESS .....
CITY ..... EW

Manufacturers Make Sales Assignments

The following appointments have recently been made by manufacturing companies:

Trico Fuse Mfg. Co. has appointed Pacific Industrial Products Co., 9th and Harrison Streets, Oakland, Calif., as its representative covering northern California; H. H. Van Luven, 307-309 E. Third Street, Los Angeles, covering southern California, all of Arizona and Nevada; Albert S. Knight Co., 3006 Western Avenue, Seattle, covering Washington, Oregon, northern Idaho and western Montana; M. F. Holland Co., Lee & Sharp Streets, Baltimore, covering the entire state of Maryland.

Fred H. Schaub Engineering Co., Chicago, has appointed A. H. Sweetnam to cover the New England area for its "Magnetrol" liquid level control for transformers, oil circuit breakers and other equipment, and W. K. Mitchell & Co., Inc., Philadelphia, contractors and fabricators, has appointed him to cover the New England area for the piping for steam and industrial plant use engineered and developed by it. Some months ago Mr. Sweetnam became New England sales representative of the C. M. Hall Lamp Co., Detroit, Mich., in special relation to radiant heat equipment.

John C. Dolph Co., Newark, N. J., has appointed the A-K Supply Co., 116 East Ninth St., Tulsa, Okla., as its representative in the state of Oklahoma. L. Morris Landers, 308 Walton Bldg., Atlanta, Ga., has been appointed representative in the states of Georgia, Alabama, South Carolina and Florida and H. S. Emanuels, 1743 First Avenue South, Seattle, Wash., representative in the states of Washington and Oregon.

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Two A.W. Groups Licensed

Although OPM limitations on house wiring materials available under priorities have changed the picture somewhat, additional local groups are making applications for licenses to operate certification. Adequate wiring bureaus at Janesville, Wis., and Mansfield, Ohio, were recently licensed. The Janesville group is known as the Southern Wisconsin Adequate Wiring Bureau. Its territory includes Janesville and portions of Dane, Jefferson, Rock and Walworth counties, Wis. At Mansfield the bureau will cover the city and certain portions of Richland County, Ohio.

•

Sponsors News Broadcast

Johns-Manville has announced the sponsorship of "Elmer Davis and the News" over a nation-wide hook-up of 56 stations of the Columbia Broadcasting System, effective December 29. The program is being heard each evening, Monday through Friday, at 8.55 p.m., E.S.T.

LOOKING FOR A NEW MATERIAL FOR THAT PRODUCT?

TRY STAR PORCELAIN

IT is a material ideally suited to applications where resistance to electricity, heat, moisture, chemicals or weathering agents is encountered. It has also great mechanical strength.

In addition we are continually compounding new formulas to individual specifications.

Send NOW for our "SURVEY OF TECHNICAL CHARACTERISTICS". It will help you.

The STAR PORCELAIN COMPANY

51 Muirhead Ave. Trenton, N. J.

S

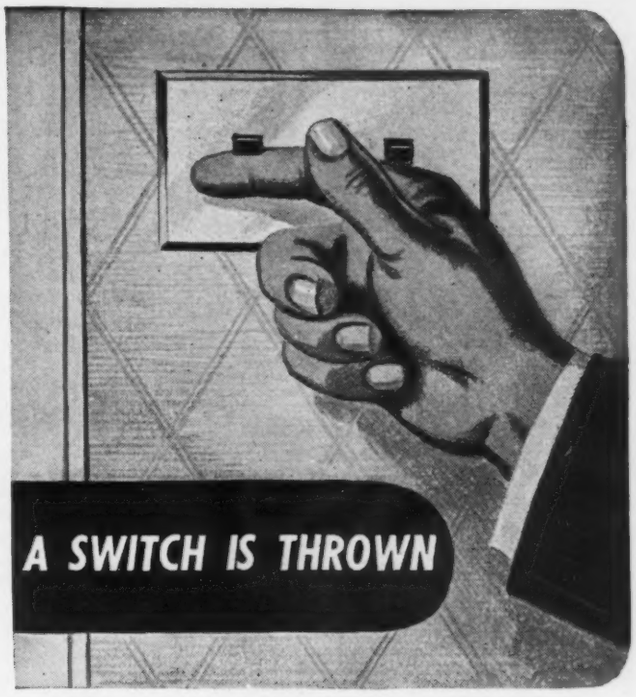
Let's Work Together—to Deliver the Goods . . . .

The Sherman Mfg. Company today is turning out materials that are vital to industrial expansion and defense. Under these conditions we need your help in order to give you the service you require.

Let us know as far in advance as possible your actual or estimated requirements. Let us advise you concerning delivery schedules. Work with us, and we think we can keep you supplied with the goods you need.

Remember, we want not only your present business but your future good will, so that you will continue to look upon Sherman as your preferred source of supply on the material we make.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.



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Central Linemen's Flare Lights are invaluable during outages or other emergencies when quick dependable illumination is imperative. Easily lighted in any weather by self contained friction cap. No matches required. Stick in a post, tree, cross arm, in the ground or carry by hand.

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BOOKS RECEIVED

Personal Leadership in Industry—2nd Edition by David R. Craig and W. W. Charters. McGraw-Hill Book Company, New York, N. Y. 245 pages. Price $2.50. How to inspire, how to reprimand, how to train employees. Revision of 1925 edition incorporates 16 years of evolutionary experience.

Electrical Wiring Specifications. By Earl Whitehorne, McGraw-Hill Book Co., New York. 181 pages, illustrated. Price $2.50.

An Introduction to the Operational Calculus. By Walter J. Seeley. International Textbook Co., Scranton, Pa. 165 pages, illustrated. Price $2. An electrical engineering professor painstakingly elucidates the superiority of the operational calculus over the differential equation procedure for electrical engineering problems.

Industrial Accident Prevention—2nd Edition. By H. W. Heinrich; McGraw-Hill Book Co., New York. 448 pages, illustrated. Price $3. An authentic case treatment by an insurance expert of causes and correctives in all mechanized industry.

Gaseous Conductors: Theory and Engineering Applications. By James Dillon Cobine; McGraw-Hill Book Co., New York. 606 pages, illustrated. Price $5.50. A Harvard text stretching from kinetic theory, ionization and emission to phenomena in rectifiers, circuit interrupters and cathode-ray oscillographs.

Engineering Electricity—3d Edition. By Ralph G. Hudson, John Wiley & Sons, Inc., New York. 284 pages, illustrated. Price $3. Designed for M.I.T. students in other than electrical engineering departments.

Practical Arc Welding—By W. J. Chaffee. Published by Hobart Trade School, Troy, New York. 516 pages, illustrated. Price $2. A trade school text. Prominent are 41 lessons of instruction on all kinds of joints for operation training, symbols, dictionary of terms, discussions of strength, costs, arc characteristics, A.S.T.M. tests and special practice, carbon arc.

Theory of Gaseous Conduction and Electronics. By Frederick A. Maxfield and R. Ralph Benedict. McGraw-Hill Book Company. 483 pages, illustrated. Price, $4.50. Treats high-vacuum conduction in tubes, also phenomena of corona, sparking, arcs and glows.

Fundamentals of Vacuum Tubes. Second Edition. By Austin V. Eastman. McGraw-Hill Book Company. 583 pages, illustrated. Price, $4.50. Treatment modernized, expanded and rearranged with separation of theory and practice.

Principles of Electron Tubes. Herbert J. Reich. McGraw-Hill Book Company. 398 pages, illustrated. Price, $3.50. Essentially an abridgment of the author's "Theory and Applications of Electron Tubes."

Electronics—First Edition. By Jacob Millman and Samuel Seely. McGraw-Hill Book Company, New York City. 721 pages, illustrated. Price, $5. Develops theory and interprets electronic devices in light of it.

Electrical Engineering Fundamentals. By George F. Corcoran and Edwin B. Kurtz. John Wiley & Sons, Inc., New York. 450

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Every fastening user should have Harper's 1942 Catalog and Buyer's Guide. It contains numerous tables of standard dimensions, weights, chemical properties, physical properties, etc. Describes 4320 STOCK ITEMS of Brass, Bronze, Everdur, Monel and Stainless Bolts, Nuts, Screws, Washers, Rivets and accessories . . . and numerous special fastenings made to order.

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Yacht Rigging and Forgings

(An imaginary conversation with a yachtsman)

Q..."How many strands in your stays (wire rigging)?"

A..."Six strands, but nineteen wires to the strand."

Q..."Why not use one large wire?"

A..."One wire would have to be pretty husky to take that strain."

And there is a very crude but effective explanation of the grain structure in a forging. Many tough fibres of steel make up the forging billet. Forging further refines this grain structure, giving superior strength with lightness.

THE BREWER-TITCHENER CORPORATION
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FORGERS OF HI-LINE HARDWARE

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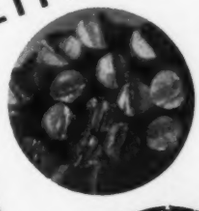
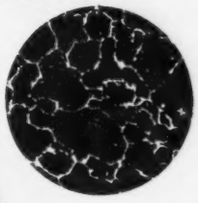
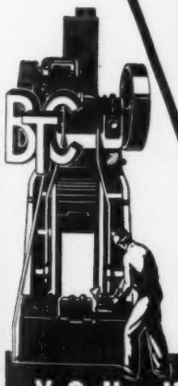




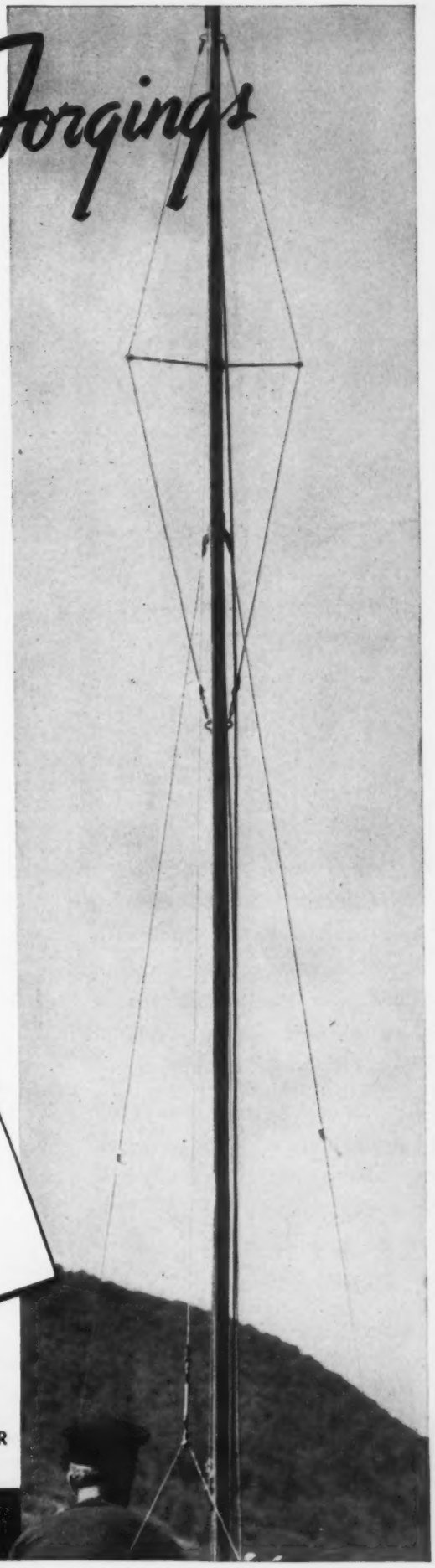
To the left is a photomicrograph of one strand out of six, in a piece of 1/8 inch wire. Directly beneath it is a section of a photomicrograph taken from a steel company's grain chart. This particular photo was selected only because it so aptly demonstrates the similarity in the minute wires and the actual grain of the forging billet. This grain can be controlled in the forging process to give strength at all points.

A fully illustrated booklet outlining the history of forging will be sent free on request as long as the supply lasts.



THROUGH YOUR INSULATOR MANUFACTURER ONLY

YOU KNOW WITH A FORGING



You cut out waste motion when you use the Fargo Connector. It's built as one unit, free from loose parts, and *always threaded.* No time lost starting a nut, no chance of cross threading.

Re-use the Fargo Connector, again and again. With its rugged Everdur body and Duronze bolt, the Fargo Connector "grips like a vise" every time.

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LINE MATERIAL CO.
MILWAUKEE, WIS.

pages, illustrated. Price, $4. Basic principles emphasized rather than equipment and practices.

Elements of Electrical Engineering—Fourth Edition. By Arthur L. Cook. John Wiley & Sons, Inc., New York. 622 pages, illustrated. Price, $4.

Effective Foremanship. First Edition. Edited by Harold B. Maynard. McGraw-Hill Book Co., New York. 263 pages, $2.50. Fourteen industrial specialists (largely Westinghouse and General Electric) contribute solutions to current problems of production supervision.

New Encyclopedia of Machine Shop Practice. Editor, Prof. G. W. Barnwell. Published by W. H. Wise & Co., New York. 561 pages, illustrated. Price, $1.98. Inexpensive and simple-English compendium of accepted methods and practices in metal-working with hand and machine tools.

Time and Timekeepers—By Willis I. Milham. Macmillian Company, New York. 616 pages, illustrated. Price, $1.98. Astronomy professor writes historically and technically of construction, care, testing, adjustment and accuracy of clocks, watches, chronometers and precision timers. Appendices have chronology, glossary and bibliography for those interested in precise time.

•

Survey of Northwest Facilities Ordered

Administrator Paul J. Raver has ordered further studies by Bonneville Power Administration engineers of all public and private power facilities in the Pacific Northwest to determine what steps should be taken by the federal government to insure continuous and adequate power supplies for defense industries.

S. E. Schultz, Bonneville's chief engineer, will direct the investigation with the view to making recommendations as soon as possible, Mr. Raver said.

The Administrator said that at the present time there were no power shortages in the region, due to the fact that adequate supplies of water are available to keep generating stations operating at capacity. He added, however, that the time might come in the near future when water supplies at some plants would become inadequate and Columbia River power from Bonneville and Grand Coulee dams would be needed to bolster resources of other plants.

•

KDKA Starts New Program

"Adventures in Research," a series of fifteen-minute radio interviews dramatizing activities in industrial research, has been started by station KDKA, Pittsburgh, Pa. Interviewed during each program will be a leading engineer or scientist from the Westinghouse Research Laboratories.

"JENNE" Safety Holder

promotes safe, economical use of stiff, high-strength guy strands. Readily carried to location (wt. 11 lbs.) where proper guy length is drawn out through largest ring without attention at Holder.

30 days' free trial if not fully convinced by advantageous field use of over 500 units (up to 35 for single property) with only 1% returned as unsuitable—or, send for descriptive literature, including data on strands used.

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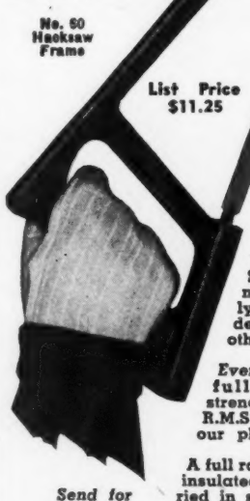

No. 60 Hacksaw Frame

List Price $11.25

Strong, light weight steel frame, heat treated and tempered to prevent set. Takes any standard 12" blade. COHARDITE insulation solidly molded on the frame and tested to 20,000 volts R.M.S. Shape of frame makes it particularly valuable for underground work or in other confined spaces.

Every tool tested to its **full rated dielectric strength for one minute R.M.S before it leaves our plant.**

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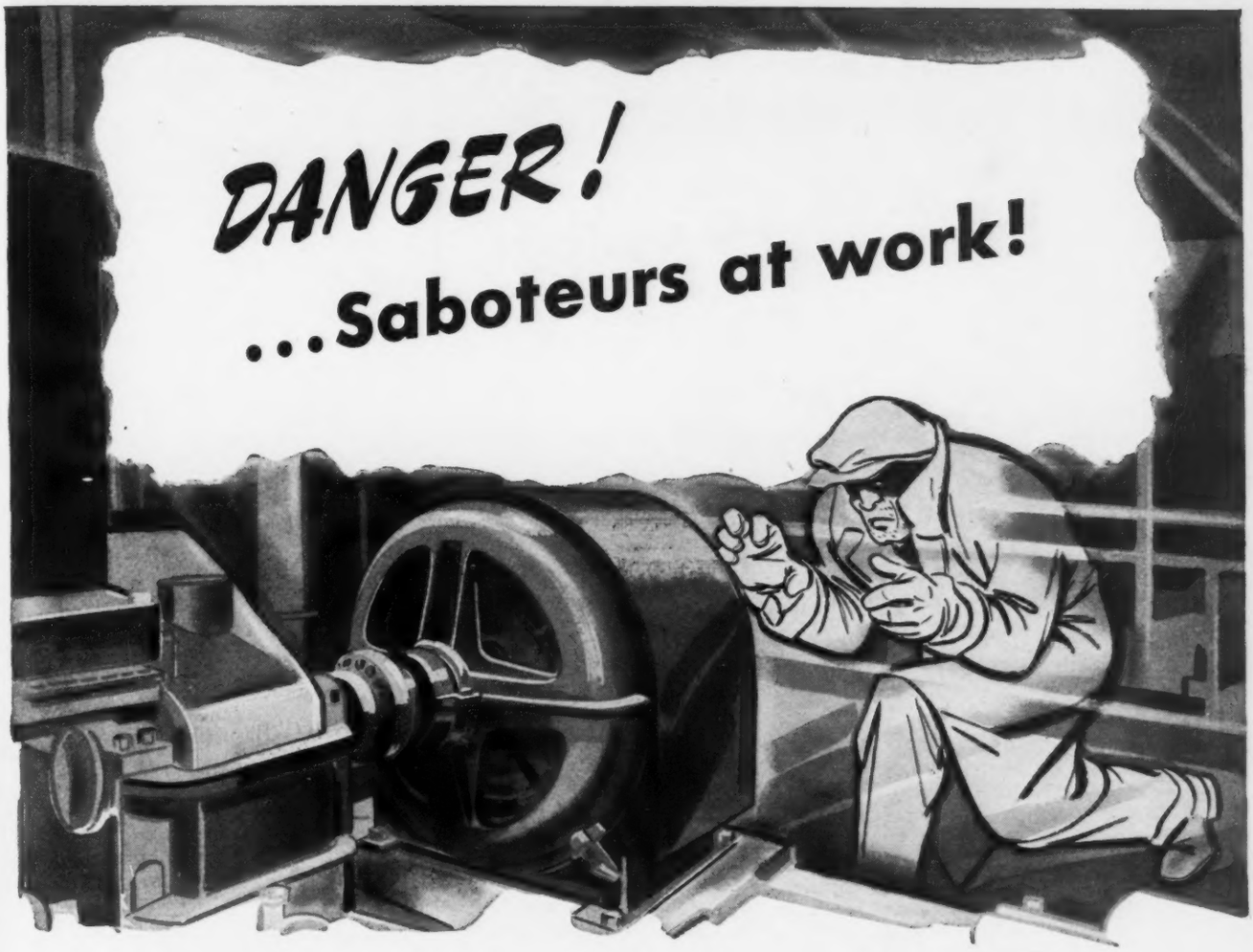

THIS MOTOR just up and quit—on a vital production job. And the saboteur who kicked it out of service was *"faulty insulation"*.

Sure, it will be back on the job in a couple of days, good as new—but 48 hours today is a month of yesterdays. And motor breakdowns require vital replacement materials.

So, you ask—why do some motors or generators falter—before their time? Why do some built up mica insulations stand up after others fail?

The answer can be very involved but basically it's this: Raw mica must be hand picked for insulation. Let even one poor case slip by and it spells trouble. Let the quality of one batch of bonding material drop—and countless motor users suffer.

That's why it pays—whether you make motors, buy them or use them—to come to *Insulation Headquarters*. We have been working with Mica for 50 years—select the "pick of the crop" from our own mines—the richest deposits in the world. And then split it, clean it and build it up with the skill and methods that only a pioneer can acquire.

It means that today we are making mica products better than even a few years ago—and can assure you that an ample supply of the best quality insulation is still available. So, to meet the threat of costly repairs and out-of-service time, insist on motor insulation—the way Mica Insulator Company makes it. There is no better way.

Mica Insulator Company's products include—Micanite and Super Micanite (built-up Mica Insulations) in sheets, tapes, rods, tubes and molded shapes; Lamicoid laminated Bakelite for both electrical and mechanical applications; Empire Varnished Cloths, Tapes and Tubing; and a wide variety of other insulating materials.

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Associate Editor for Engineering, Electrical World

7th Edition, 2303 pages 6x9, 1700 illustrations, 600 tables, $8.00

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—definitions, conversion factors, physical and mathematical principles.
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—criteria and results in applying electricity in various industries, etc.
—the information you want in the form in which you can use it; the means of avoiding errors, saving time and trouble in procuring vital information, assuring yourself of best results in handling a wide variety of problems.

Here is the great standard reference work of all in the electrical engineering profession or whose work in industry or engineering touches on this field. Its 2303 pages present a handy-reference compilation of practical, usable data from all fields of electrical engineering practice, plus the most frequently required fundamental theory, units, and systems of measurement, made dependable by the work of more than 100 engineers, scientists, teachers, and other authorities.

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Before setting the pattern for the new edition, the Editor-in-Chief interviewed a large number of users of previous editions, to see what they would like the new edition to be. As a result of their suggestions, the Seventh Edition contains such basic improvements as more emphasis on handy-reference compilation of usable facts, less historical material and more data about equipment, materials, and practices, more sources of industry standards, codes and specifications, and expanded index, as well as complete revision of subject matter to keep abreast of current practice.

Thousands of useful facts in these

26 BIG SECTIONS

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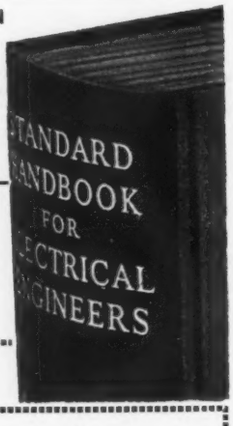

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New Rural Unit Will Build Dams, Plant

Western North Carolina Electric Membership Corporation, a $10,000,000 concern with headquarters in Charlotte, N. C., has been organized for the purpose of generating and distributing electric power and building ten dams and a generating steam plant to serve 31 counties in western North Carolina and eastern Tennessee.

The new corporation has been formed by superintendents of nine Rural Electrification projects in Tennessee and North Carolina. At the organization meeting held in Charlotte, Mark W. Bennett of Marshall, N. C., was named president.

James C. Moore of Waynesville, N. C., superintendent, stated that the corporation is to build dams and a steam generating plant which will furnish electric power to the REA organization in 29 North Carolina and two Tennessee counties. These organizations have a total of 13,000 members.

At the organization meeting B. O. Vannort of Charlotte was elected to handle the engineering for the big development. He was instructed to begin surveys at once. This survey, according to Mr. Vannort, will require several months. When the survey is completed, the Federal government, through the REA, will be asked to make a loan to finance the building of the hydro-electric plants, a steam generating plant and 750 miles of high tension electric lines, according to Superintendent Moore, who added that the whole project is designed to meet a 30,000 kw. demand.

•

Study Kings River Plan

Further engineering studies are under way on the proposed Kings River project near Fresno, Calif. George W. Howson of the U. S. Bureau of Reclamation has been assigned to work with Kings River interests. The co-operative work is expected to be the basis for subsequent negotiation of a repayment contract for construction of the irrigation, flood control and power project. The studies will supplement a previous investigation and report made by the Bureau of Reclamation and approved by Secretary of the Interior Harold L. Ickes in January, 1940, under which the project is authorized for construction by the bureau. No funds for its construction yet have been made available. According to the original report, the power plant at the base of the dam would have an initial installation of one 15,000-kw. generating unit, with space for future installation of two additional units of the same size.

Gas Fuel for Power at Aluminum Plant

To supply fuel for the generating plant that will furnish electrical power for the federal government's $33,000,000 aluminum plant near Hot Springs, Ark., the Arkansas Louisiana Gas Company will construct an 80-mile pipeline from the southwest Arkansas gas fields. The line will deliver 40,000,000 cu.ft. of gas daily, the amount estimated that will be required to generate the power.

The electric plant at the aluminum industry will have a capacity of 120,000 kw. Apparently no new construction would be required to provide the plant with electric power pending the completion of its own generating plant. A pool of private utilities will supply the power.

R. E. Ritchie, vice-president of the Arkansas Power & Light Co., which will head the power pool, said only a few miles of lines, only two or three at the outside, would have to be constructed to bring power to the plant while the power plant which will be built to serve the project is under construction.

•

Utility Advertising Applies Quiz Idea

An unusual application of the quiz contest idea in institutional advertising is being tried out by Portland General Electric Co., Portland. The first month's returns amounted to 6,750 entries among the 15,700 boys and girls between the ages of 8 and 18 years who had registered.

Each registrant received a booklet of facts about the early history of Portland and the relation of the development of electric light and power service thereto. They were asked to answer ten questions based on the material in this booklet, the tenth being "What Use of Electricity in Your Home Means the Most to You? Why?" to be answered in 25 words. Emphasis of these questions lay in the long-time operation of the company and its predecessors in the community and the part played by the company in the growth and development of the community.

The contest is divided into two age groups, 8 to 12 and 13 to 18, with separate questions and identical prizes for each group. First prize in each group is a one week's trip to a Dude Ranch in eastern Oregon next summer. Following this are 37 other prizes in each group consisting of radios, I.E.S. student lamps and clocks. The contest series is to continue six months with a new set of questions based on new

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Pure Copper, Cold forged bolt of ample strength for all purposes. High copper content prevents corrosion and season cracking. All edges are rounded. 65,000 pounds tensile value.

"V" groove, clamping jaw of cold forged, pure copper. Flanged sides give greater bearing surface on nut, hence greater strength and no distortion of clamping jaw.

97% copper content, hard metal nut—strong as steel. Full thread engagement with bolt.

Broad, strong head, with size plainly marked. Sides of head have flat surface so wrench or pliers can grip tightly.

85% plus, full thread, die stamped, insures full engagement in nut, hence high strength connectors.

"V" shaped groove, holds wires in three point contact and prevents rocking or looseness.

Made in 12 sizes—6 of forged copper and 6 of machined high strength, high copper content alloy —for No. 10 to 1,000,000 CM conductors.

Send for bulletin and free samples and convince yourself of their superiority.

66-NU X22-NU

44-NU 22-NU

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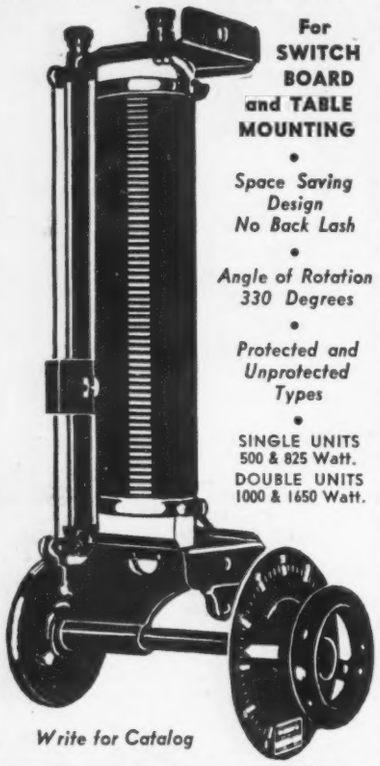
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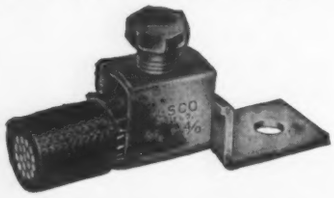
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•

Criticises Federal Power Monopoly

Organization of a state-wide committee to oppose non-essential public spending and formation of any type of Columbia power authority, designed to create a federal power monopoly in the Pacific Northwest by destroying other competing public or private systems, has been announced by Walter P. Fell, who for 14 years was president of the Eugene, Ore., water board, which directs operations of that city's municipal electric power system.

Charging that Secretary of Interior Ickes is seeking money and authority from Congress which the people have repeatedly denied him, Mr. Fell said: "Every benefit which federal advocates claim they can produce if their $250,000,000 power authority bill goes through can be done on an expenditure of $1,000,000 under the Boehnke-Rodman plan, which originated in Eugene and is being sponsored by our organization.

"The plan," he explained, "revolves around the simple matter of pooling electric power for defense and civilian use everywhere in the Northwest and immediately accomplishing it by interconnecting all public and private systems. This method has been used many years. Surveys by competent engineers indicate that approximately 100,000 kw. of additional power for war industries could be gained without increasing present generating facilities. Furthermore, all sacrifices of state rights, the rights of people and water rights of irrigationists such as the proposed Columbia power authority bill contemplates would be wholly prevented.

"Eugene," Mr. Fell continued, "has become one of America's best-managed public utilities because for 25 years it has applied practical business principles to business problems. The Bonneville-Grand Coulee administration, under Secretary Ickes, on the other hand, habitually uses the political approach. . . . Now with America fighting for its life, these would-be federal monopolists are running to Congress asking for hundreds of millions for destructive spending to promote one of their pet 'isms.' They are doing this at a time when Americans everywhere are being asked to make heavy sacrifices themselves, and the people in turn are appealing to government heads to end all needless spending and concentrate everything possible on the hard task of successfully prosecuting war."

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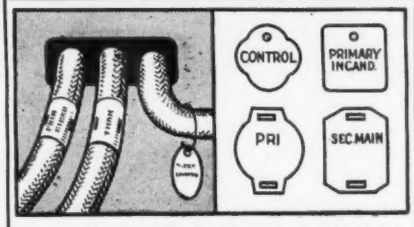

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* Editorial Engineering News Record, Dec. 18, 1941.

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British Columbia Co. Reorganizing Sales

Complete reorganization of the sales policy of the British Columbia Electric Railway Company in connection with both electrical and gas appliances has now been completed in order to conform to the desire of the Dominion Government to conserve labor and materials normally used in industrial production for the manufacturing of war equipment.

As a result of the complete change in its merchandising program the B.C.E. will discontinue installment allowances which have been made for the wiring of electric ranges and will also discontinue other inducements which have been made by B.C.E. in common with other Canadian public utilities for the purpose of developing appliance sales.

W. C. Murrin, president of B.C.E., in announcing the departure from a load-building policy which has been followed along most aggressive lines in the past by the B.C.E., and which has proved definitely beneficial to both the company and all its co-operating appliance dealers, points out that the new policy of discontinuing such allowances and retarding, rather than promoting, sales will mean considerable sacrifice on the part of firms and individuals engaged in this type of business.

Mr. Murrin states that the new policy will also mean a sacrifice on the part of the public, which has come to regard labor-saving home appliances as a necessity rather than a luxury. He believes, however, that all will willingly accept the necessary sacrifices.

As a result of the decision to withdraw installment allowances and other special inducements on appliance sales an entirely new sales policy is being developed under the direction of W. G. Mainwaring, general sales manager of the company, and complete details of this policy will be announced in the near future.

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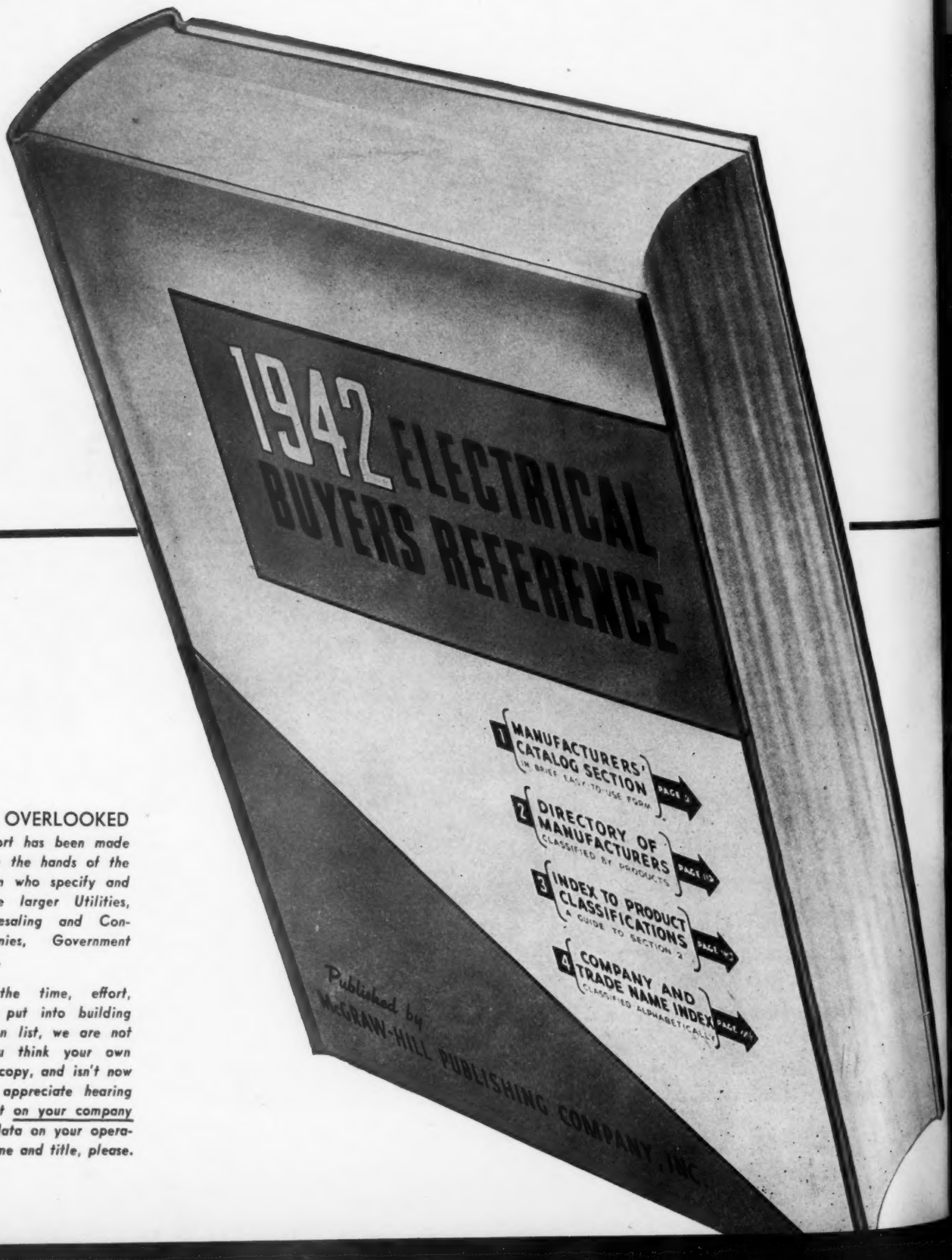
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